4 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental consequences associated with the four alternatives described in Chapter 2: no action, proposed action (with the proposed and two alternative transmission line routes), alternative technologies, and mitigation measures. Impacts to resources in the United States due to the construction and operation of transmission lines in Imperial County and operation of the Termoeléctrica de Mexicali (TDM) and La Rosita Power Complex (LRPC) power plants are analyzed.

The following sections address potential impacts to 12 resource areas for each alternative. Because activities associated with transmission line construction and power plant operations affect these areas differently, the discussion of impacts under each section is tailored to focus only on those aspects of each alternative that would have relevant impacts. For example, impacts due to plant operations are analyzed in detail with respect to air quality, water resources, and biological resources, but are not discussed with respect to geology and soils, cultural resources, or visual resources.

Likewise, a number of resource areas would have similar impacts from various alternatives. For example, geology and soil impacts would be similar for all the action alternatives (proposed action, alternative technologies, and mitigation measures). Accordingly, in the sections that follow, a discussion of impacts is not repeated if the impacts are the same as under an alternative already discussed.

Finally, impacts from alternative transmission line routes are examined in each resource area as they apply. The discussion of impacts from the alternative routes is presented along with the proposed routes analysis only if the impacts are expected to differ. If no discussion of alternative routes impacts is presented for a given resource area, the reader may assume that impacts for the alternative routes would be the same as those for the proposed routes for that resource area.

The discussion of impacts from the mitigation measures alternative is presented either in qualitative terms or quantitatively on a per unit basis (e.g., fugitive dust emissions reduced per mile of paved road, or quantity of PM_{10} reductions per bus converted from diesel fuel to compressed natural gas). This approach is necessary because the potential locations for many of the mitigation measures are unknown, or DOE and BLM do not have specific information on potential project designs needed to conduct a site-specific analysis.

For the proposed action, that is, the granting of one or both of the Presidential permits and ROWs, for most resource areas, the analysis was bounded by calculating impacts as if both lines had been allowed. This serves two purposes. First, it demonstrates the maximum possible impacts; second, it clearly presents the combined impacts of the agencies' preferred alternative, that is, permitting both facilities. The only exceptions to this methodology are in the areas of air, water, and human health. For these areas, because of the particular concerns expressed by the commentors (and the court), the impacts are presented separately for each facility as well as in combination.

4.1 GEOLOGY, SOILS, AND SEISMICITY

This section evaluates the potential impacts to geologic and soil resource attributes from the construction and operation of the proposed transmission lines and two alternative routes in the United States. Construction activities represent the principal means by which geologic and soil resources could be affected.

4.1.1 Major Issues

There were no major issues raised pertaining to geologic and soil resources or seismic conditions.

4.1.2 Methodology

The main elements in assessing impacts to geologic and soil resources are the amount and location of land disturbed during construction, which would include grading for new access roads, excavating for suspension tower footings, and staging of equipment in designated areas. The seismicity analysis addresses the earthquake hazard associated with active fault systems in the project area.

Geologic and soil conditions along the proposed alternative transmission line routes were observed in the field in November 2003. Surveys of the area of the projects, including topographic surveys, geologic and seismic hazard maps, and soil surveys were also reviewed as part of this analysis.

The impact analysis for geologic resources evaluates effects to critical geologic attributes, including access to mineral or energy resources, destruction of unique geologic features, and mass movement induced by the construction of the transmission lines. The impact analysis also evaluates regional geologic conditions such as geologic resources and earthquake potential.

The impact analysis for soil resources evaluates effects to specific soil attributes, including the potential for soil erosion and compaction by construction activities. The soils analysis addresses the discrete area of land within the area of the projects for the proposed transmission line routes.

The determination of the magnitude of an impact is based on an analysis of both the context of the action and the intensity of the impact to a particular resource. For this analysis, the context is the immediate area of the transmission line routes as shown in Figure 2.2-1. The intensity of the impact is considered in terms of the relative land area disturbance on the basis of the required construction techniques and the degree to which the proposed action may adversely affect resources within the designated area of concern. Impacts to unique characteristics of the area, for example, mineral resources, are also considered.

4.1.3 No Action

4.1.3.1 Geology

Under the no action alternative, both Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. Therefore, no impacts to geologic resources would be expected. Current geologic conditions would continue as described in Section 3.1.1.

4.1.3.2 Soils

Under the no action alternative, the transmission lines would not be built; therefore, no prime farmland soils would be disturbed. Erosional processes would continue naturally in undisturbed areas as described in Section 3.1.3.

4.1.3.3 Seismicity

Under the no action alternative, the transmission lines would not be built; therefore, the potential seismic hazards associated with active fault systems in the project area would not be a relevant concern.

4.1.4 Proposed Action

The analysis for this alternative focuses on the 6-mi (10-km) portion of the lines from the U.S.-Mexico border to the IV Substation as it is currently designed and also evaluates the impacts of two alternative routes, one to the east of the existing line but within BLM-designated Utility Corridor N, and the other to the west of the existing line that runs outside the utility corridor and then along the U.S.-Mexico border.

4.1.4.1 Geology

Placement of the transmission lines, access roads and spurs, and temporary staging areas would require some disturbance, removal, and compaction of surface and near surface material. Because of the relatively flat topography of the area of the projects, however, the potential for slope failure would be low.

No active sand and gravel or fill mining occurs within BLM-designated Utility Corridor N or to the west of it (Marty 2003). Therefore, no impact to geologic resource availability would be expected from construction of the proposed or alternative transmission line routes.

4.1.4.2 Soils

The soils along the proposed and alternative transmission line routes would be affected at the support structure sites, access roads and spurs, construction areas, and staging areas. Although no cultivated land would be disturbed, it is likely that the lower portion of the western alternative route could cross prime farmland soils.

Temporary and permanent impacts would occur during the construction phase in the immediate area of construction-related activities. Impacts would include an increased potential for soil erosion because of removal of vegetation to prepare the site. Soil erosion would also increase due to soil disturbance associated with grading to construct access roads and spurs, and due to excavation associated with installing the tower support structures, work areas around each tower, pull sites, lay-down areas, and the trench for optical cables. Another impact would be soil compaction due to vehicle usage of the access roads and spurs and heavy equipment within the lay-down areas. Lay-down areas would only be used for the monopoles and A-frames since the steel lattice towers would be delivered by helicopter.

The access road along the existing SDG&E line would be used for north-south access to support structures along the proposed routes. From this main access road, east-west spurs would be constructed to access each tower. Since the Intergen and Sempra towers would be positioned roughly parallel to one another along the existing 230-kV SDG&E line, soil disturbance could be minimized by using one east-west spur to access the two towers at each tower location. The east-west spurs would be graded to create an unpaved roadbed about 10 to 12 ft (3 to 4 m) wide to accommodate construction equipment. Approximately 250 linear feet of new access road (i.e., spurs) would be needed for a maximum of 25 tower and 9 monopole locations (for each line). This is an area of about 3,000 ft^2 (279 m^2) for each tower location, or 75,000 ft^2 (1.72 acres or 0.70 ha) for the lines.

New access roads and spurs of similar width would need to be constructed for the eastern and western alternative routes. The eastern alternative routes would be about 0.5 mi (0.8 km) longer than the proposed routes and would require three additional tower sites for each line. The western alternative routes would be about 2 mi (3 km) longer than the proposed routes and would require 10 additional support structures for each line. Assuming access road lengths of 6.8 mi (10.9 km; eastern routes) and 8.3 mi (13.4 km; western routes) and 250 linear feet for east-west spurs at each additional tower location, it is estimated that construction of access roads and spurs for the eastern and western routes would involve additional areas of permanent soil disturbance of about 10.10 acres (4.1 ha) for the eastern routes and 12.78 acres (5.2 ha) for the western routes.

The installation of steel lattice tower footings would involve excavating a pit of 3 to 4 ft (0.9 to 1.2 m) in diameter to a depth of about 15 ft (4.6 m) at each corner of the tower. Therefore, an area of about 201 ft^2 (18.7 m^2) would be permanently impacted at each lattice tower site (50.27 ft^2 or 4.7 m^2 for each corner). The disturbed area associated with the installation of monopole footings would be less (about 100 ft^2 or 9.3 m^2) since the footing diameters would range from 8 to 10 ft (2 to 3 m), and only one footing would be needed. For the proposed action, the total area of disturbance for up to 25 lattice towers on both the Sempra and Intergen transmission lines would be about 10,050 ft^2 (934 m^2); the nine monopoles would impact an area of about 1,800 ft^2 (167.2 m^2). Because the eastern and western alternative routes are longer, the soil disturbance due to lattice tower footing excavation would be greater: about 11,256 ft^2 (1,046 m^2) for the eastern routes (with 28 tower sites on each line) and 14,070 ft^2 (1,307 m^2) for the western routes (with 35 tower sites on each line). The number of monopoles for the eastern and western alternative routes would be about 9 and 12, respectively. Permanent soil disturbance associated with the installation of monopole footings would be about 1,800 ft^2 (167 m^2) for the eastern routes and 2,400 ft^2 (223 m^2) for the western routes. Installation of footings for a total of eight crossing (A-frame) structures would permanently impact an area of about 1,609 ft^2 (150 m^2) (201 ft^2 [18.7 m^2] per structure) for the proposed routes and either of the eastern or western alternative routes.

Temporary soil disturbance would occur during construction in the work areas around each tower. The work areas around suspension towers would be about 52 ft by 52 ft (15.8 m by 15.8 m) or 2,704 ft^2 (251 m^2) to accommodate the 30-ft by 30-ft (9.1-m by 9.1-m) base. For the dead-end towers, the work areas would be about 62 ft by 62 ft or 3,844 ft^2 (357 m^2) to accommodate the 40-ft by 40-ft (12.2-m by 12.2-m) base. Subtracting an area of 201 ft^2 (18.7 m^2) of permanent soil disturbance due to footing installation at each tower, the total areas of temporary soil disturbance due to work area activity for suspension towers and dead-end towers would be about 85,102 ft^2 (7,900 m^2) and 58,288 ft^2 (5,411 m^2), respectively, for both lines. Because the eastern and western alternative routes are longer, the total soil disturbance due to work area activity is expected to be greater, about 158,408 ft^2 (14,717 m^2) and 193,450 ft^2 (17,972 m^2), respectively.

Temporary soil disturbance would also occur during construction in the pull site and lay-down areas. Pull sites are associated with the steel lattice transmission towers and would involve an area of 30 ft by 50 ft (9.1 m by 15.2 m) or 1,500 ft^2 (139 m^2) at each tower. There are an estimated 25 pull sites for each transmission line under the proposed action; considering the Sempra and Intergen lines together, a total of 75,000 ft^2 (6,968 m^2) or 1.72 acres (0.70 ha) would be temporarily impacted. Since additional pull sites would be needed for each transmission line under both alternative routes, the temporary impacts due to pull site activity along these routes are expected to be greater. Lay-down areas would be used to assemble each monopole. Each pole would be lifted into place using a 90-ton (80-t) crane. For the proposed routes, an area of about 52,481 ft^2 (4,876 m^2) or 1.21 acres (0.49 ha) would be disturbed.

Other areas of temporary soil disturbance associated with construction include an optical line trench (0.06 acre [0.02 ha]) and substation (9.5 acres or [4 ha]).

4.1.4.3 Seismicity

The California Department of Conservation, Division of Mines and Geology (now the California Geological Survey) has developed a series of 7.5-minute quadrangle maps delineating active or potentially active fault traces associated with the San Andreas, Calaveras, Hayward, and San Jacinto faults. For efficiency, only faults that are “sufficiently active” (with surface displacement within the past 11,000 years) and “well-defined” (with a clearly detectable trace at the surface or just below the surface) are mapped and evaluated (Hart and Bryant 1997).

Although the Imperial Valley is seismically active, neither the proposed routes nor the alternative routes lie within an Alquist-Priolo fault-rupture hazard zone. On the basis of the California Geological Survey’s ongoing evaluation of fault zones to date, surface fault rupture is not likely to occur along the proposed or alternative transmission line routes.

4.1.5 Alternative Technologies

The use of more efficient emissions controls and/or an alternative cooling technology would not change the transmission line configurations as described under the proposed action; thus, the impacts to geologic and soil resources for this alternative would be the same as those described in Section 4.1.4 for the proposed action.

4.1.6 Mitigation Measures

This alternative would use the same transmission line configurations as described under the proposed action; therefore, the impacts for this alternative for the transmission lines would be the same as those described in Section 4.1.4.

Paving of roads would lead to some temporary, short-term impacts to soils along road ROWs. Some soil compaction or minor erosion could occur from surface disturbance caused by paving equipment and worker vehicles parked along areas being paved. The overall impact of road paving would be beneficial because it would reduce fugitive dust emissions and soil erosion.

Similar impacts could occur at the construction sites of the compressed natural gas fast-fill stations proposed in Brawley or adjacent to the Calexico Unified School District.

Implementation of dust controls, such as chemical dust retardants and crushed rock on areas prone to wind erosion at the Imperial County Airport, would be beneficial.

4.2 WATER RESOURCES

Water resources potentially impacted by the proposed action include the New River, the Salton Sea, and the pilot wetland project at Brawley along the New River. The Pinto Wash, which crosses the proposed ROWs, could also be affected by transmission line construction activities. There are no natural wetlands along the New River (Barrett 2004) or the Pinto Wash. Groundwater has been encountered in borings at depths of 25 to 30 ft (8 to 9 m) near the IV Substation.

4.2.1 Major Issues

Major issues pertaining to water resources include:

- Impacts to water quantity and quality (particularly TDS) in the New River;
- Impacts to water quantity and quality (particularly TDS) in the Salton Sea;
- Impacts to water quantity, quality (particularly TDS), and temperature in the Brawley pilot wetland project along the New River;
- Impacts of using a different cooling technology at the power plants;
- TDS removal in power plant water treatment systems; and
- Impacts on the region's 4,000-mg/L TDS surface water objective.

These topics are considered in the impacts analysis presented in the following sections.

4.2.2 Methodology

4.2.2.1 Direct Impacts

To evaluate the direct impacts to water quantity and quality in the New River, existing and historical flow and quality data for the river were compared to projections from each alternative. Changes in flow and depth of flow were used to estimate the impacts to floodplains, wetlands, and erosion potential along the river channel.

Data on power plant operations and pretreatment of Mexicali municipal wastewater were used to estimate changes in salinity (TDS), selenium loading, and concentrations of other water quality parameters (e.g., selenium, TSS, BOD, COD, and total phosphorus) for the New River.

4.2.2.2 Indirect Impacts

Indirect impacts were evaluated in terms of the changes in water quantity and quality at Salton Sea and the pilot wetland project at Brawley. Indirect impacts to groundwater in the Imperial Valley Groundwater Basin were also evaluated.

4.2.2.2.1 Salton Sea. The Salton Sea receives water from many sources, including the Alamo River, New River, Whitewater River, Salt Creek, San Felipe Creek, IID agricultural drains, precipitation, groundwater, and overland flow. The Salton Sea has impaired water quality because of high salinity and high nutrient concentrations (eutrophic conditions with phosphorus being the limiting nutrient). Because the Salton Sea receives water from the New River, operation of the power plants would indirectly affect the quantity and quality of inflow water to the Sea and its depth, surface area, volume, and quality.

The volumetric loss of water resulting from operation of the power plants is compared with mean annual inflows to the Salton Sea. Estimates are then made of the annual change in depth of water and change in surface area of the Salton Sea caused by water consumption during plant operations. These changes are compared with the Sea's mean annual depth and surface area using depth/volume and depth/area curves developed by Weghorst (2001).

Operation of the power plants would also affect the quality of water in the Salton Sea. Impacts to water quality are evaluated in terms of changes in salinity, selenium (a contaminant of concern for the Salton Sea because of its concentration in bottom sediments and biomagnification), and total phosphorus. For salinity, the change in the Sea's TDS was estimated using a mass balance approach (Appendix F). Salinity increases with time in the Sea because salt, unlike water, does not evaporate and is not removed by chemical or physical processes. An estimate was made using mass balances to determine a new rate of salinization for the Sea under conditions of plant operations. Using this new rate of salinization, the time required for the Sea to reach a salinity of 60,000 mg/L (a level detrimental to fishery resources) was then calculated and compared with the time required under existing conditions. The same mass-balance approach was used to estimate the effect of plant operations on selenium and phosphorus concentrations for the Sea.

4.2.2.2.2 Brawley Wetland. About 7 ac-ft (8,600 m^3) of water is pumped annually from the New River and allowed to flow through a series of ponds and rushes that make up the Brawley wetland before being returned to the river. Indirect impacts to the Brawley wetland due to power plant operations would be caused by changes in water quality in the New River (e.g., salinity and TSS, BOD, COD, and total phosphorus loads) since the New River provides source water for the wetland.

Impacts of changed flows because of plant operations were evaluated by comparing the consumptive water loss with mean and low annual flows and flow variability. An additional comparison was made for the water required for operating the pilot wetland at Brawley.

Similarly, impacts from additional salinity and selenium loading were compared with mean annual loads and their variability.

4.2.3 No Action

Under the no action alternative, only the EAX unit at the LRPC would be able to operate; the TDM plant would not operate. Water use under this alternative is shown in Table 4.2-1. Impacts to water quality are presented in Tables 4.2-2 through 4.2-7 for plant operations under four scenarios: (1) no plants operating, (2) LRPC plant (including both EAX and EBC units) operating alone, (3) TDM plant operating alone, and (4) TDM and LRPC plants combined (proposed action). Because the no action alternative would result in impacts only from operation of the EAX unit at the LRPC and the EAX unit uses about 69% of total water used by the LRPC plant, water quality impacts under the no action alternative would be smaller than those shown for operation of the entire LRPC plant alone and greater than those shown for no plants operating.

4.2.4 Proposed Action

Under the proposed action, DOE and BLM would grant both Presidential permits and ROW grants. This would allow operation of the EBC plant and the TDM plant. Although the

TABLE 4.2-1 Water Use for No Plants Operating, No Action, and Proposed Action

		No Action	Proposed Action		
Water Use (ac-ft/yr)	No Plants Operating	LRPC-EAX[a]	LRPC-EAX and EBC	TDM	Both Plants Operating
Water taken from lagoons	0	6,211	9,015	4,372	13,387
Water consumed by plant(s)	0	4,940	7,170	3,497	10,667
Water discharged by plant(s) after use	0	1,271	1,845	875	2,720
Water discharged from lagoons	33,200	26,989	24,185	28,828	19,813
Net water delivered to New River	33,200	28,260	26,030	29,703	22,533
Percent change in water delivered to New River	NA[b]	-14.9	-21.6	-10.5	-32.1

[a] Water use by the EAX unit at the LRPC plant is about 68.9% of that used by the entire LRPC plant (i.e., the EAX and EBC units).

[b] NA = not applicable.

TABLE 4.2-2 Projected Annual Operating Parameters[a,b]

Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
Water Volumes				
From lagoons to power plants (ac-ft/yr)[c]	0	9,015	4,372	13,387
Consumed by plant operations (ac-ft/yr)	0	7,170	3,497	10,667
Discharged after use (ac-ft/yr)	0	1,845	875	2,720
Discharged from lagoons to New River (ac-ft/yr)	33,200	24,185	28,828	19,813
Net volume to the New River (ac-ft/yr)	33,200	26,030	29,703	22,533
Percent change in volume delivered to the New River	0	-21.6	-10.5	-32.1
TDS				
Concentration in lagoon effluent (mg/L)	1,200	1,200	1,200	1,200
Concentration in discharge water (mg/L)	NA	4,800	4,430	4,680
Concentration load to New River from discharge water (million lb)[d]	NA	24.1	10.5	34.6
Load to New River from lagoons (million lb)	108.37	78.95	94.10	64.67
Change in load to New River from lagoons (million lb)	0	-29.4	-14.3	-43.7
Total load to New River (million lb)	108.37	103.05	104.6	99.27
Net change in load to the New River (million lb)	0	-5.3	-3.7	-9.0
Percent change in load to the New River	0	-4.9	-3.4	-8.3
TSS				
Concentration in lagoon effluent (mg/L)	59	59	59	59
Concentration in discharge water (mg/L)	NA	5	5	5
Concentration load to New River from lagoons (million lb)	5.33	3.88	4.63	3.18
Change in load to New River from lagoons (million lb)	0	-1.45	-0.70	-2.15
Load to New River from plant discharge (million lb)	NA	0.025	0.012	0.037
Net change in load to New River (million lb)	0	-1.43	-0.69	-2.12
BOD				
Concentration in lagoon effluent (mg/L)	44	44	44	44
Concentration in discharge water (mg/L)	NA	10	10	10
Load to New River from lagoons (million lb)	3.97	2.90	3.45	2.37
Change in load to New River from lagoons (million lb)	0	-1.07	-0.52	-1.6
Load to New River from plant discharge (million lb)	NA	0.05	0.024	0.074
Net change in load to New River (million lb)	0	-1.02	-0.50	-1.52
COD				
Concentration in lagoon effluent (mg/L)	162	162	162	162
Concentration in discharge water (mg/L)	NA	15	15	15
Load to New River from lagoons (million lb)	14.61	10.66	12.70	10.61
Change in load to New River from lagoons (million lb)	0	-3.95	-1.91	-4.0
Load to New River from plant discharge (million lb)	NA	0.075	0.036	0.111
Net change in load to New River (million lb)	0	-3.89	-1.87	-5.76

TABLE 4.2-2 (Cont.)

Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
Phosphorus				
Concentration in lagoon effluent (mg/L)	4.3	4.3	4.3	4.3
Concentration in discharge water (mg/L)	NA	1.5	1.5	1.5
Load to New River from lagoons (million lb)	0.39	0.28	0.34	0.23
Change in load to New River from lagoons (million lb)	0	-0.11	-0.05	-0.16
Load to New River from plant discharge (million lb)	NA	0.0075	0.0036	0.0.011
Total load to the New River	0.39	0.29	0.34	0.24
Net change in load to New River (million lb)	0	-0.10	-0.05	-0.15
Selenium				
Concentration in lagoon effluent (mg/L)	0.0011	0.0011	0.0011	0.0011
Concentration in discharge water, assuming a 75% reduction[e] (mg/L)	NA	2.5×10^{-4}	2.5×10^{-4}	2.5×10^{-4}
Load to New River from lagoons (lb)	99.3	72.4	86.3	59.3
Change in load to New River from lagoons (lb)	0	-26.9	-13.0	-40.0
Load to New River from plant discharge (lb)	NA	1.3	0.6	1.9
Total load to the New River (lb)	99.3	73.7	86.9	61.2
Net change in load to New River (lb)	0	-25.6	-12.4	-38.1
Percent change in load	0	26	12	38

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the “Only LRPC Operating” column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the “Only LRPC Operating” scenario. Similarly, impacts under the proposed action are conservatively represented by values in the “Both Plants Operating” column. All values in the table represent plants operating at 100% capacity.

[b] Abbreviations: BOD = biochemical oxygen demand; COD = chemical oxygen demand; NA = not applicable; TDS = total dissolved solids (salinity); TSS = total suspended solids; LRPC = LaRosita Power Complex; TDM = Termoeléctrica de Mexicali.

[c] To convert ac-ft/yr to m^3/s, multiply by 3.911×10^{-5}.

[d] To convert lb to kg, multiply by 0.4536.

[e] A 75% reduction in discharge water concentration is a standard value for industry (Hammer [1977]).

TABLE 4.2-3 Changes in New River Water Flows Caused by Plant Operations[a]

Physical Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
Calexico Gage				
Mean flow (ac-ft/yr)[b]	180,000	172,830	176,503	169,333
Percent change in annual flow	0	-4.0	-1.9	-5.9
Standard deviation in flow (ac-ft/yr)	45,827	NA[c]	NA	NA
Change in flow as a percent of standard deviation	0	15.7	7.6	23.3
Westmorland Gage				
Mean flow (ac-ft/yr)	465,180	458,010	461,683	454,513
Percent change in flow	0	-1.5	-0.8	-2.3
Standard deviation in flow (ac-ft/yr)	30,769	NA	NA	NA
Change in flow as a percent of standard deviation	0	23.3	11.4	34.7

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the “Only LRPC Operating” column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the “Only LRPC Operating” scenario. Similarly, impacts under the proposed action are conservatively represented by values in the “Both Plants Operating” column. All values in the table represent plants operating at 100% capacity.

[b] To convert ac-ft/yr to m^3/s, multiply by 3.911×10^{-5}.

[c] NA = not applicable.

EAX export turbine (a portion of the EAX unit) at the LRPC plant would operate under the no action alternative, the impacts to water resources associated with operation of that unit also are included in the proposed action because the electrical output of that turbine would be exported to the United States over the proposed transmission lines under almost all circumstances. The operation of the EAX export turbine requires the operation of the water cooling system at the EAX plant. However, the amount of water lost to evaporation during the cooling process as a result of the operation of the EAX export turbine is only about one-third of the water usage associated with operation of the entire EAX unit. Therefore, impacts to water quality parameters shown under the “Both Plants Operating” column in Tables 4.2-2 through 4.2-7 conservatively represent the impacts from the proposed action (as the proposed action has been defined for purposes of this EIS); that is, impacts shown under the “Both Plants Operating” column are higher than the impacts resulting from the operation of the TDM, the EBC plant, and the EAX export turbine.

TABLE 4.2-4 Changes in New River Water Depth Caused by Plant Operations[a]

Physical Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
Calexico Gage				
Mean depth (ft)	9.52	9.43	9.48	9.39
Percent change in depth	0	-0.95	-0.42	-1.37
Mean depth of flow for mean flow conditions minus the depth of flow for a flow equal to the mean value minus one standard deviation (ft)	0.58	NA[b]	NA	NA
Change in depth as a percent of depth for a flow of one standard deviation less than the mean value	0	15.52	6.90	22.42
Westmorland Gage				
Mean depth (ft)	6.04	5.99	6.02	5.97
Percent change in depth	0	-0.83	-0.33	-1.16
Mean depth of flow for mean flow conditions minus the depth of flow for a flow equal to the mean value minus one standard deviation (ft)	0.20	NA	NA	NA
Change in depth as a percent of depth for a flow of one standard deviation less than the mean value	0	25.00	10.00	35.00

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the “Only LRPC Operating” column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the “Only LRPC Operating” scenario. Similarly, impacts under the proposed action are conservatively represented by values in the “Both Plants Operating” column. All values in the table represent plants operating at 100% capacity.

[b] NA = not applicable.

4.2.4.1 Direct Impacts of Plant Operations: New River

Operations of the LRPC and TDM power plants would directly impact the New River by reducing the flow of water that it would receive from the Zaragoza Oxidation Lagoons in Mexicali, Mexico, and modifying its quality. Table 4.2-2 provides information on water use by the two power plants and water quality parameters associated with the water use.

4.2.4.1.1 Flow of Water in the New River. During operations, the LRPC and TDM plants would extract water from the Zaragoza Oxidation Lagoons, thereby reducing the quantity of water discharged from the lagoons to the New River. With no plants operating, the lagoons would deliver about 33,200 ac-ft/yr (1.30 m^3/s) of water to the New River (Table 4.2-2). This volume of water is about 20% of the average flow of 180,000 ac-ft/yr (7.04 m^3/s) at the Calexico gage at the U.S.-Mexico border.

TABLE 4.2-5 Changes in New River Water Quality Parameter Concentrations at the Calexico Gage Caused by One Year of Power Plant Operations[a]

Physical Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
TDS				
Concentration (mg/L)	2,620	2,717	2,664	2,766
Percent change in concentration	0	3.7	1.7	5.6
Standard deviation of concentration (mg/L)	315	NA[b]	NA	NA
Change in concentration as percent of standard deviation	0	31	14	46
TSS				
Concentration (mg/L)	52.7	51.9	52.4	51.5
Percent change in concentration	0	-1.5	-0.6	-2.3
Standard deviation of concentration (mg/L)	9.6	NA	NA	NA
Change in concentration as percent of standard deviation	0	8.3	3.1	12.5
BOD				
Concentration (mg/L)	27.5	26.5	27.0	25.9
Percent change in concentration	0	-3.6	-1.8	-5.8
Standard deviation of concentration (mg/L)	11.5	NA	NA	NA
Change in concentration as percent of standard deviation	0	8.7	4.4	13.9
COD				
Concentration (mg/L)	53.6	47.6	50.7	44.5
Percent change in concentration	0	-11.2	-5.4	-17.0
Standard deviation of concentration (mg/L)	20.4	NA	NA	NA
Change in concentration as percent of standard deviation	0	29.4	14.2	44.6
Phosphorus				
Concentration (mg/L)	2.00	1.90	1.96	1.85
Percent change in concentration	0	-5.0	-2.0	-7.5
Standard deviation of concentration (mg/L)	0.27	NA	NA	NA
Change in concentration as percent of standard deviation	0	37.0	14.8	55.6
Selenium				
Concentration (mg/L)	0.02100	0.0218	0.0214	0.0223
Percent change in concentration	0	3.8	1.9	6.2
Standard deviation of concentration (mg/L)	0.021	NA	NA	NA
Change in concentration as percent of standard deviation	0	3.8	1.9	6.2

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the "Only LRPC Operating" column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the "Only LRPC Operating" scenario. Similarly, impacts under the proposed action are conservatively represented by values in the "Both Plants Operating" column. All values in the table represent plants operating at 100% capacity.

[b] NA = not applicable.

TABLE 4.2-6 Physical Changes to the Salton Sea Produced by Plant Operations[a,b]

Physical Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
Annual mean inflow (ac-ft/yr)[c]	1,340,000	1,332,830	1,336,503	1,329,333
Percent change in inflow	0	-0.54	-0.26	-0.80
Standard deviation of inflow	78,750	NA[d]	NA	NA
Change in inflow as percent of standard deviation	0	9.1	4.4	13.6
Volume (ac-ft)	7,624,843	7,617,673	7,621,346	7,614,176
Percent change in volume of Sea	0	-0.09	-0.05	-0.14
Elevation (ft MSL)	-227	-227.03	-227.02	-227.05
Change in elevation (ft)	0	-0.03	-0.02	-0.05
Percent change in elevation	0	-0.013	-0.009	-0.002
Standard deviation in water elevation (ft)	0.5	NA	NA	NA
Change in elevation as percent of standard deviation	0	6.0	4.0	10.0
Area (acre)	234,113	234,047	234,082	234,016
Change in area	0	-66	-31	-97
Percent change in area	0	-0.028	-0.013	-0.041
Standard deviation in area	1,100	NA	NA	NA
Change in area as percent of standard deviation	0	6.0	2.8	8.8

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the “Only LRPC Operating” column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the “Only LRPC Operating” scenario. Similarly, impacts under the proposed action are conservatively represented by values in the “Both Plants Operating” column. All values in the table represent plants operating at 100% capacity.

[b] These values are only accurate to three significant figures (e.g., 1,340,000 ac-ft/yr is only meaningfully represented as 1,340,000 ac-ft/yr). Inflow values in this table are meant to show arithmetically the relatively small changes that would occur due to plant operations as compared to baseline conditions.

[c] To convert ac-ft/yr to m^3/s, multiply by 3.911×10^{-5}.

[d] NA = not applicable.

As shown in Table 4.2.2, operation of the LRPC at 100% power for 365 days per year would consume 7,170 ac-ft (0.28 m^3/s) of water. Operation of the TDM power plant at 100% power for 365 days per year would consume 3,497 ac-ft (0.14 m^3/s). Operation of the power plants would, therefore, reduce the flow of water to the New River from the lagoons and power plant outfalls from 33,200 ac-ft/yr (1.30 m^3/s) (Section 3.2.1.2) to 26,030 ac-ft/yr (1.02 m^3/s) for operation of the LRPC; 29,703 ac-ft/yr (1.16 m^3/s) for operation of the TDM plant; and 22,533 ac-ft/yr (0.88 m^3/s) for operation of both plants. With both plants operating, the net water delivered to the New River from the lagoons and power plant canals would be reduced by about 32% (Table 4.2-2).

TABLE 4.2-7 Changes to Salton Sea Inflow and Water Quality Due to Plant Operations[a,b]

Physical Parameter	No Plants Operating	Only LRPC Operating	Only TDM Operating	Both Plants Operating
TDS				
Salton seawater volume (ac-ft)[c]	7,624,843	7,617,673	7,621,346	7,614,176
Change in water inflow to Salton Sea (ac-ft/yr)	0	-7,170	-3,497	-10,667
Change in inflow load (million lb/yr)[d]	0	-5.3	-3.7	-9.0
Concentration resulting from inflow volume reduction (mg/L)	44,000	44,042	44,021	44,063
Percent change in load	0	-0.10	-0.05	-0.14
Rate of Increase				
Total input of salt (million lb/yr)	9,200	9,195	9,196	9,195
Increase in concentration (mg/L/yr)	443.57	443.74	443.57	443.76
Change in rate of concentration increase (mg/L/yr)	0	0.17	0	0.19
Time to reach a concentration of 60,000 mg/L (yr)	36.07	36.06	36.07	36.06
Net concentration resulting from volume change and inflow for 1 year (mg/L)	44,444	44,486	44,465	44,507
Percent change in concentration after one year	0	0.09	0.05	0.14
Phosphorus				
New River load in 1999 (million lb)	1.455	NA[e]	NA	NA
Change in load due to plant operations (million lb/yr)	NA	-0.10	-0.05	-0.15
Percent change in New River load	0	-6.9	-3.4	-10.3
Total load to the Salton Sea in 1999 (million lb)	2.838	NA	NA	NA
Percent change in load	0	-3.5	-1.8	-5.3

[a] For purposes of this analysis, impacts under the no action alternative are conservatively represented by values in the "Only LRPC Operating" column. These values were calculated on the basis of the entire LRPC plant operating (including both the EAX and EBC units). Since only the EAX unit at the LRPC plant would operate under the no action alternative, impacts resulting from no action would be about 69% of those identified for the "Only LRPC Operating" scenario. Similarly, impacts under the proposed action are conservatively represented by values in the "Both Plants Operating" column. All values in the table represent plants operating at 100% capacity.

[b] Values in this table were calculated using methods described in Appendix F.

[c] To convert ac-ft to m^3, multiply by 1,233.64.

[d] To convert lb to kg, multiply by 0.4536.

[e] NA = not applicable.

Because flow into the New River from the lagoons and power plants would be decreased by plant operations, flow at the Calexico gage would also be decreased. The average flow of water in the New River at the gage in Calexico, California, is about 180,000 ac-ft/yr (7.04 m^3/s), and the annual average flow at the downstream gage at Westmorland, California, is 465,180 ac-ft/yr (18.19 m^3/s) for the period of record 1980 through 2001 (Section 3.2.1.1 and Table 4.2-3). At the Calexico gage, the volume of water consumed by LRPC and TDM plant operations represents about 4% and 1.9% of the average annual flow in the river, respectively. At the downstream gage at Westmorland, California, the volume of water consumed by plant operations would represent about 1.5% and 0.8%, respectively. These values are less than those at the Calexico gage because of additional inflow of water to the New River between the two gage locations. Together, the plants would consume about 5.9% of the annual flow at the Calexico gage and 2.3% of the annual flow at the Westmorland gage.

Flow in the New River at the Calexico and Westmorland gages is variable (Section 3.2.1.1). The standard deviations of annual flows at the Calexico and Westmorland gages are 45,827 and 30,769 ac-ft/yr (1.79 and 1.20 m^3/s), respectively, based on USGS gage data for a 22-year period from 1980 through 2001. The volume of water that would be consumed by LRPC and TDM plant operations represents 15.7% and 7.6% of the standard deviation in flow at the Calexico gage, respectively, and about 23.3% and 11.4% of the flow variability at the Westmorland gage, respectively (Table 4.2-3). The percentage at the Westmorland gage is higher than that at the Calexico gage because the flow is less variable at the downstream location. Together, annual water consumption by the power plants would represent about 23.3% and 34.7% of the standard deviation in annual flow at the Calexico and Westmorland gages, respectively.

Because the flow of water in the New River would be reduced, the depth of the water in the river would also be decreased (Table 4.2-4). Using the relationships presented in Section 3.2.1.1, the depth of the water at the Calexico gage for average annual conditions would be reduced from 9.52 to 9.43 ft (2.90 m to 2.87 m) by operations at the LRPC plant. This is a decrease of about 0.09 ft (2.7 cm), approximately 1 in. This difference represents a 1.0% change in depth from the mean (average) value, and a 15.5% change relative to the mean depth minus the depth at a flow that corresponds with the mean flow minus one standard deviation (0.58 ft [17.7 cm]) (Section 3.2.1.1). TDM plant operations would reduce the mean depth of the water at the Calexico gage from about 9.52 ft (2.90 m) to 9.48 ft (2.89 m), a difference of 0.04 ft (1.2 cm). Combined operations of the two plants would decrease the mean depth of the water at the Calexico gage to 9.39 ft (2.86 m), a difference of about 0.13 ft (3.9 cm).

Operations at the LRPC plant would also decrease the depth of water at the downstream gage at Westmorland, California (Table 4.2-4). The mean depth of the water at this gage is about 6.04 ft (1.84 m), and the difference in depth between the mean value and the depth for a flow corresponding with the mean value minus one standard deviation for the period of record 1993 through 2001 was 0.2 ft (6.1 cm) (Section 3.2.1.1). The average annual depth of the water due to operations at the LRPC would be 5.99 ft (1.83 m), a decrease of about 0.05 ft (1.5 cm). Operations at the TDM plant would decrease the depth of water at the Westmorland gage to about 6.02 ft (1.83 m), a difference of approximately 0.02 ft (0.6 cm). Combined operations of the two plants would reduce the average annual depth of water at the Westmorland gage by about 0.07 ft (2.1 cm).

As indicated by the above discussion, the largest percentage change in flow would occur at the Calexico gage under combined operations of the LRPC and TDM plants. Because it would use more water, the larger portion of the change would be derived from operations at the LRPC plant. The change in flow would be about 4% of the mean value, which is about 16% of the standard deviation of the flow at this gage. The percent change at the downstream Westmorland gage would be less because of less flow variability at this location.

If the low annual flow for the New River was used for the analysis, the percentage of flow lost to plant use would increase to about 9% at the Calexico gage. At the Westmorland gage, the combined use of water for the two plants would decrease the flow by 2.6%, which is about 34% of the standard deviation in flow at this location. Because water use for the plants is an average quantity for an assumed power generation of 100% for 365 days per year and the flow in the New River is variable on a less-than-daily basis, changes to flow and depth are best indicated by using mean annual values. Changes in flow and depth produced by power plant operations lie well within the variability of the flows for the New River.

Standard Deviation

A statistical measure of spread or variability. The definition for standard deviation is the square root of the variance. In more simple terms, standard deviation is a statistic that tells you how tightly all of the various examples you are looking at are clustered around the mean (average) in a set of data. When the examples are tightly bunched together, the standard deviation is small. When the examples are spread apart, the standard deviation becomes relatively large. In the case of the New River, numerous measurements have been taken of flow rate over a 1-year period. The standard deviation of these measurements was then calculated as a measure of the normal variation of flow.

The percent of the standard deviation shown in the tables is presented to show the influence of the power plants on normal variation. A value less than 1 standard deviation falls within the normal range of variation within a system over a given period of time.

4.2.4.1.2 New River Water Quality. The following sections discuss the effects of water treatment on TDS, TSS, BOD, COD, selenium, and phosphorus and their impacts on New River water quality at the Calexico gage. Secondary treatment of the sewage water used by the power plants also would remove biological constituents, which are not discussed in detail in this EIS. However, the water treatment disinfection processes would produce beneficial impacts to the New River by reducing the presence of fecal coliform and *E. coli* and enterococci bacteria in the discharge water.

TDS. During operations of the power plants, dissolved solids would be added to the New River from three sources: discharge water from the Zaragoza Oxidation Lagoons, discharge water from the LRPC plant, and discharge water from the TDM plant. The power plants obtain water from the Zaragoza Oxidation Lagoons (LRPC from the inlet and TDM from the outlet) and treat it by using five major components (Simões 2004b):

1. Biological treatment reactor and secondary clarifiers,

2. DensaDeg® reactor,

3. Demineralizer plant,

4. Press and filter house, and

5. Waste sump.

The first two processes — biological treatment and DensaDeg — treat the entire makeup stream for each of the power plants, which removes some TDS from the water, as discussed below. The water is introduced into the biological treatment reactor and clarifiers. At this point, biological treatment is used to oxidize organic matter and NH_3 and to remove nitrates that form as a result of the oxidation of NH_3. This step removes significant quantities of dissolved organics, NH_3, and phosphorous compounds, and agricultural and industrial chemicals. The clarifiers separate the activated sludge from the water and recirculate the sludge to the biological reactor. Water balance analyses performed for this component of the water treatment show that for an incoming stream with a TDS of 1,200 mg/L, the effluent displays a TDS concentration of 1,180 mg/L.

Additional and substantial TDS removal occurs in the next stage of the treatment process, the DensaDeg reactor. The DensaDeg reactor is a commercially available, proprietary, physical-chemical process that uses lime softening and clarification in two tanks. The majority of the TDS removal occurs in this step of the water treatment process (other processes include the above biological treatment reactor, moisture in the sludge removed, and cooling tower drift). In this step, lime (calcium hydroxide) is added to the water, which causes calcium and magnesium to precipitate, as well as substantial amounts of alkali metals, heavy metals, and phosphate. The precipitated sludge is flocculated and separated from the water by sedimentation in the clarifier and sent to the press and filter house. Effluent from this step has a TDS that ranges from about 900 to 1,000 mg/L.

The remaining water treatment components do little to further reduce the concentration of TDS in the water. In the waste sump, wastewater is collected from the cooling tower basin, demineralizer waste streams, and steam-cycle blowdown. The combined effluent that is discharged to receiving channels that ultimately discharge to the New River has a TDS of 4,430 mg/L at TDM and 4,800 mg/L at the LRPC (Table 4.2-2). Although the TDS concentration in the effluent is higher than that in the influent water from the lagoons, the annual load to the New River is reduced by approximately 3.7 million lb (1.7 million kg) by the water treatment process.

The water treatment process used at the LRPC is similar to that described above, and lime treatment reduces the annual TDS load to the New River by 5.3 million lb (2.4 million kg) (Table 4.2-2).

The above calculations were based on the assumption that the power plants operate 100% of the time. However, when the plants are in a bypass mode (i.e., not generating power due to maintenance or forced outages, such as those produced by equipment failures and market conditions), the water is only treated in the biological reactor and clarifiers before being returned to the discharge channel and ultimately the New River. For these conditions, the TDS in the effluent is about the same as that from the lagoons (1,180 versus 1,200 mg/L). However, the riverine system would still benefit from the biological treatment process that removes dissolved organics and other contaminants.

These removal rates are theoretical; however, conductivity measurements performed by Degremont de Mexico (the water treatment contractor for TDM) indicate that actual concentrations in plant effluent would be lower than the theoretical values (Simões 2004b). The numbers here, therefore, should be considered a conservative estimate (i.e., larger than those that actually occur).

For purposes of analysis, the TDS in effluent from the lagoons is reported to have a value of 1,200 mg/L (Henao 2004). The TDS concentration in the discharge water from the power plants would be 4,800 mg/L and 4,430 mg/L for the LRPC and TDM plants, respectively (Henao 2004). Water withdrawn from the lagoons for operation of the LRPC and TDM power plants would contain approximately 29 million and 14 million lb (13 and 6.4 million kg), respectively, of dissolved solids. Approximately 24.1 million lb (11 million kg) from the LRPC plant and 10.5 million lb (4.8 million kg) from TDM plant discharge water would later be returned to the New River. This would result in a net reduction of annual TDS load in the New River of approximately 5.3 million and 3.7 million lb (2.4 and 1.7 million kg) from operation of the LRPC and TDM power plants, respectively. With both plants operating at 100% capacity, the annual TDS load to the New River would be reduced by about 9 million lb (4.1 million kg) or about 8%. Actual TDS reductions would be less because the lime softeners are bypassed when the plants are not running. TDM estimates that the wastewater treatment plants would be run in bypass mode, that is, bypassing the lime softener, 25% of the time (Simões 2004b). Assuming a similar bypass rate for LRPC, TDS removal would be 25% less (2.25 million lb [1 million kg] less), since most TDS is removed by the lime softeners. Also, as noted above, the portion of TDS removal attributable to the proposed action would be about 30% less than the total for both plants operating, which accounts for the portion attributable to the EAX Mexico turbines.

Water discharged from the power plants and the Zaragoza Oxidation Lagoons would mix with water in the New River. Changes in TDS concentration in the river were calculated using a simple, mass-balance mixing model that included the New River, the Zaragoza Oxidation Lagoons, and discharges from the LRPC and TDM power plants (Appendix F). As indicated in Table 4.2-5, the TDS concentration in the New River would be increased by operating the power plants, even though the annual total TDS load to the river would be reduced. This increase in concentration would occur because of the higher TDS concentration in the discharged effluent from the power plants and less water flowing in the river. The TDS concentration increases would be about 4% and 2% of the mean value for TDS in the river due to operations of the LRPC and TDM plants, respectively. Operation of the LRPC plant would have a greater impact on TDS because it would have a greater rate of effluent discharge with a higher TDS value (Table 4.2-2).

The TDS concentration in the New River is variable at the Calexico gage. The standard deviation for TDS is about 315 mg/L (Section 3.2.1.1). Changes in the TDS for the river produced by plant operations would be about 31% and 14% of the observed variability for the LRPC and TDM plants, respectively (Table 4.2-5). Combined, the plants would produce a change that would be about 46% of the standard deviation for TDS. With both plants operating, the increased TDS concentration (about 2,766 mg/L) would be less than the 4,000-mg/L water quality objective for the Colorado River Basin (SWRCB 2003) discussed in Section 3.2.1.1.

As discussed in Section 3.2.1.1.1, TDS in the New River increases in the downstream direction. On the basis of 1996 through 1998 measurements, the average TDS for the New River at its outlet to the Salton Sea is about 2,770 mL/g, with a standard deviation of 361 mg/L (IID 2002). Assuming that the flow of the New River is about the same as the flow at the Westmorland gage, which is located about 2 km (1.2 mi) upstream of the outlet, TDS at the New River outlet to the Salton Sea would be 2,828, 2,788, and 2,809 mg/L for both plants operating, only the TDM plant operating, and only the LRPC plant operating, respectively. These increases correspond to changes of 58 (2.1%), 18 (0.7%), and 39 mg/L (1.4%) over a condition in which no plants are operating, respectively. The changes would be well within the variability of the TDS measured at the New River outlet to the Sea, and the outlet flow TDS concentration would be well within the 4,000-mg/L upper bound for the Colorado River basin water quality objectives (SWRCB 2003). Calculations for other parameters (TSS, COD, phosphorous, and selenium) were not made; however, information on the removal processes indicates that impacts would be of the same magnitude as those for TDS and BOD.

TSS, BOD, COD, selenium, and phosphorus. Table 4.2-2 lists the changes that would occur to New River loads for TSS, BOD, COD, selenium, and phosphorus. In all cases, operation of the power plants would reduce the annual loads of these materials. Annual operations of the combined plants would reduce the COD load to the New River by almost 6 million lb (2.72 million kg). Combined operations would also reduce the annual loads for TSS and BOD by about 2 million and 1.5 million lb (907,000 and 680,000 kg), respectively. Phosphorus reduction would be less, about 150,000 lb (68,000 kg). Reductions attributable to the proposed action would be about 30% less than for both plants operating, which accounts for the portion attributable to the EAX Mexico turbines.

Table 4.2-5 lists the changes in New River water quality associated with TSS, BOD, COD, selenium, and phosphorus. Except for selenium, all of the parameters would have reduced concentrations under plant operations. The concentration of selenium would increase by about 6% with both plants operating. This increase would occur because of reduced flow in the river caused by plant operations. Under average conditions, the change in COD for the river would be greatest (a decrease of about 17%) with both power plants operating. The next greatest change would be for phosphorus (a reduction of about 8%). For the same conditions, BOD in the river would be reduced by almost 6%. These changes would all be less than the observed variability of the individual parameters (standard deviations) and could not be uniquely identified with any specific source; however, the reductions would all be beneficial in helping meet newly formulated sedimentation and DO (dissolved oxygen) TMDLs for the New River and Colorado River water quality objectives for total phosphorus (Section 3.2.1.1). As noted in the previous paragraph, all changes would be about 30% less for the proposed action than the total for both plants operating.

Temperature. The combined effects of LRPC and TDM power plant operations on New River water temperature would be an increase of 0.5°F (0.3°C). This value was derived by using a simple mixing-model approach similar to that used for water quality parameters (Appendix F), the above average values, and the assumption that the LRPC discharge water temperature would be similar to that of the TDM plant. This temperature increase is well within the uncertainty of the calculation. In addition, the actual change in temperature is likely to be even less, because the water discharged from the power plants would be transported to the New River through a canal that has a length of about 6 mi (10 km), thereby allowing the discharge water to approach a value more similar to the temperature of the water discharged from the Zaragoza Oxidation Lagoons.

4.2.4.2 Direct Impacts to Floodplains: Pinto Wash and New River

A floodplain assessment was conducted in accordance with DOE regulations for compliance with floodplain and wetlands environmental review as required under 10 CFR Part 1022. The transmission line projects would involve construction of towers within a 100-year floodplain along the proposed routes or along the eastern or western alternative routes.

4.2.4.2.1 Pinto Wash. Construction of footings for the support structures along the proposed transmission lines could affect the 100-year floodplain for the Pinto Wash. Since the excavations for the footings would be backfilled and the original ground contours would be restored, the impacts associated with these activities are expected to be minimal and temporary. Cylindrical sections of the footings 3 to 4 ft (0.9 to 1.2 m) in diameter would protrude above the ground surface; on the basis of plans for the proposed lines, a maximum of two lattice tower footings for each transmission line would be in the 100-year floodplain. The placement of these footings would result in minimal permanent changes to conditions in the floodplain, with minimal impacts on natural and beneficial floodplain values.

4.2.4.2.2 New River. Along the New River, changes in water flow and depth produced by power plant operations would lie well within the variability of the flows for the New River. While plant operations could result in a small theoretical reduction in maximum flood elevation, this change would have no practical effect on the incidence or extent of floods or floodplain function.

4.2.4.3 Direct Impacts to Groundwater

Construction of footings for the support structures along the proposed transmission lines could be deep enough to enter the groundwater zone. Potential impacts to groundwater from construction would be limited to temporary and localized lowering of the water table if it is necessary to dewater an excavation to install a footing.

4.2.4.4 Indirect Impacts of Plant Operations: Salton Sea and Brawley Wetland

Indirect impacts of operating the LRPC and TDM power plants would occur to the Salton Sea and the pilot wetland project at Brawley. These impacts are discussed below.

4.2.4.4.1 Salton Sea. Indirect impacts would occur to the Salton Sea because of operations at the LRPC and TDM power plants. These impacts would be to the physical characteristics of the Sea (volume, depth, and surface area) and its water quality.

Physical characteristics. For purposes of analysis, the following values are used as initial Salton Sea estimates for evaluating impacts to the system: elevation (–227 ft MSL [–69 m]); area (234,113 acres [94,743 ha]); and volume (7,624,843 ac-ft [9.405×10^9 m^3]) (Section 3.2.1.3) (Table 4.2-6). In practice, these parameters are not known precisely and have considerable variability. Use of other, similar initial conditions would not be expected to significantly change the results of the calculations presented here because of the differences in magnitude of the large parameter values and the small changes produced by plant operations.

As discussed previously, operation of the LRPC and TDM power plants would reduce the flow of water in the New River, a major tributary to the Salton Sea. Flow at the Calexico gage, 180,000 ac-ft/yr (7.04 m^3/s), represents about 13% of the total inflow to the Salton Sea (about 1.34 million ac-ft/yr [52.41 m^3/s]) from all sources [Section 3.2.1.3]). The reduction in inflow to the Sea would be about 0.5% for the LRPC plant and 0.26% for the TDM plant. Combined, the net reduction in flow would be less than 1% (approximately 0.8%) of the average value. These changes would be well within the variability of the Sea's inflow (approximately 78,750 ac-ft [3.08 m^3/s] [Section 3.2.1.3]). Combined, the net inflow reduction would be about 14% of the standard deviation of the total inflow.

A decrease in yearly inflow to the Sea would reduce its volume, lower its elevation, and decrease its surface area. As indicated in Table 4.2-6, operation of the LRPC and TDM power plants would decrease the volume of water in the Sea by 7,170 and 3,497 ac-ft (8.84×10^6 and 4.31×10^6 m^3), respectively. These reductions would be less than about 0.1% of the initial volume of the Sea. Because of the large rate of evaporation from the Sea, changes in volume would occur rapidly, and a new state of equilibrium would occur within 1 year.

Salton Sea elevations were calculated using information from Figure 3.2-14 and the reduced volumes of the Sea that would be produced by plant operations. The change in elevation of the Sea would be about –0.03 ft (–0.9 cm) and –0.02 ft (–0.6 cm) for operation of the LRPC and TDM plants, respectively. These values would be about 0.01% each of the initial elevation of –227 ft (–69 m) MSL. The standard deviation of the Sea's elevation is about 0.5 ft (15 cm) (Section 3.2.1.3). Changes in elevations produced by plant operations would account for about

6% and 4% of the Sea's variability (Table 4.2-6). Combined, the loss in elevation of the Sea would be about 10% of the Sea's variability.

Along with a decreased volume and decreased elevation, a reduction in the inflow to the Sea would decrease its surface area. The change in area associated with operating the LRPC and TDM power plants would be about 66 acres (27 ha) and 31 acres (13 ha), respectively. Combined, the area loss would be about 97 acres (39 ha) (Table 4.2-6). These values correspond to losses of about 0.03, 0.01, and 0.04% of the Sea's initial surface area. For a standard deviation in surface area of 1,100 acres (445 ha) (Section 3.2.1.3), operation of the LRPC and TDM plants would reduce the Sea's surface area by about 6% and 3% of the Sea's variability, respectively.

Water quality. Operation of the LRPC and TDM power plants would indirectly impact water quality in the Salton Sea through changes in annual loads delivered to the Sea by the New River. Indirect impacts of decreased loads of BOD, COD, TSS, and pathogens resulting from plant operations (in particular wastewater treatment prior to use) would all beneficially impact the Sea. However, indirect impacts produced by changes in the annual loads of TDS, phosphorus, and selenium would be of greater importance to the overall health of the Salton Sea. These impacts are discussed below.

TDS: Currently, the Salton Sea has a TDS concentration of approximately 44,000 mg/L. For an initial elevation of –227 ft (–69 m) MSL and a volume of 7,624,843 ac-ft (9.405×10^9 m^3) (Section 3.2.1.3), the Sea has about 9.1261×10^{11} lb (4.1388×10^{11} kg) of salt (Table 4.2-7). Under plant operations, the volume of water flowing in the New River to the Salton Sea would be reduced (Table 4.2-3) and its TDS concentration increased.

In the Salton Sea, the rate of evaporation is equal to the rate of water inflow from all sources. Any change in the rate of water inflow (increase or decrease) would result in a concomitant change in the volume of the Sea, its elevation, and its surface area. The change in surface area would likewise result in a change in the rate of evaporation, which would match the new rate of water inflow, thus reestablishing the equilibrium between inflow and evaporation and stabilizing the Sea at some new elevation. Because the rate of evaporation of the Salton Sea is very high (about 70.8 in/yr [1.8 m/yr], Section 3.2.1.3), the Sea would adjust its elevation to the reduced inflow caused by the annual operation of the power plants after 1 year. Although the volume of the Sea would be reduced by plant operations, the total quantity of salt in the Sea would remain the same (except for changes produced by additional inflows containing salt during the time that the Sea is adjusting to a reduced inflow). Using a mass-balance approach (Appendix F), modified salt concentrations were calculated for a reduced Sea volume (Table 4.2-7, under TDS). With both plants operating, the TDS concentration of the Sea would increase by approximately 0.14% to 44,063 mg/L. The dissolved solids concentration would increase by about the same percentage that the Sea's water volume is reduced.

In addition to a change in TDS concentration produced by reducing the volume of the Salton Sea, its TDS would also be affected by changes in the TDS load delivered by the New River. Assuming that the inflow of salt to the Salton Sea with no plants operating is approximately 9,200 million lb/yr (4,172 million kg/yr) (Section 3.2.1.3), the rate of salinity increase can be estimated for given Salton Sea volumes (Table 4.2-7, under rate of increase). In the absence of plant operations, the rate of salinity increase would be about 443.6 mg/L/yr. This value agrees well with values cited in Section 3.2.1.3. With both plants operating, the TDS concentration would increase by an additional 0.2 mg/L/yr to about 443.8 mg/L/yr. Even though the salt load from the New River would be decreased by plant operations, the rate of TDS increase in the Sea would go up because of the reduced volumes predicted for the Sea. With both power plants operating, the Salton Sea would reach a salinity of 60,000 mg/L in 36.06 years, for an initial concentration of 44,000 mg/L. This value is 0.01 year (about 4 days) sooner than without the plants operating. With the uncertainty in the input parameters used for this calculation, the rates and times should be considered to be the same and not distinguishable, and the Sea's TDS concentration would reach 60,000 mg/L in about 36 years, with or without the plants operating.

After 1 year of power plant operations, the concentration of TDS in the Salton Sea would be a combination of increases, due to a reduced Sea volume and an increase due to additional salt loading from its tributaries. Table 4.2-7 lists the TDS values predicted after 1 year of plant operations. With both plants operating, the TDS concentration for the Sea would be about 44,510 mg/L. This value can be compared to a TDS value of about 44,445 mg/L for no plants operating for the same time period. This TDS value is expected to be conservative (i.e., higher than the actual value) because not all salts entering the Sea add to its TDS, some precipitate (Section 3.2.1.3). The TDS value predicted for both plants operating for 1 year is much less than the 60,000-mg/L value that would be detrimental to fishery resources and much less than the precision reported in the measurement (about 2,200 mg/L) (Section 3.2.1.3).

Phosphorus: As discussed in Section 3.2.1.3, phosphorus is a limiting nutrient for Salton Sea eutrophication. Most of the phosphorus enters the Salton Sea from the New River. In 1999, the total phosphorus load to the Sea was about 2.838 million lb (1.287 million kg); of this load, the New River supplied about 1.455 million lb (659,860 kg), or about 50% of the total (Section 3.2.1.3) (Setmire 2000). Operation of the LRPC and TDM power plants would reduce the load of phosphorus to the Salton Sea by 100,000 and 50,000 lb (45,350 and 22,680 kg), respectively. These reductions would be about 7% and 3% of the phosphorus load for the New River, and about 4% and 1.8% of the total phosphorus load to the Sea (Table 4.2-6). Because the concentration of phosphorus in the Sea has been nearly constant for more than 30 years, annual changes in the load of the magnitude estimated for operation of the power plants would be unlikely to change the degree of eutrophication for the Sea. As discussed by Setmire (2000), a 50 to 80% reduction in phosphorus load could be needed to significantly change its eutrophic state. However, any reduction in phosphorus load would be beneficial.

Selenium: Operation of the power plants would reduce the quantity of selenium that would be discharged to the New River and the Salton Sea. However, water consumption by the plants would slightly raise the concentration of selenium in the remaining water of the New River (Table 4.2-5). Operation of the LRPC and TDM power plants would reduce the selenium load to the New River and the Salton Sea by about 26 and 12 lb (11.8 and 5.4 kg), respectively. Most of the selenium inflow is from agricultural land and is largely found in Sea sediments. For a dissolved concentration of one part per billion (ppb) in Salton Sea water, the mass of selenium present would be about 20,740 lb (9,400 kg). Operation of the LRPC and TDM power plants would, therefore, reduce the selenium input to the sea by an amount equivalent to about 0.1% and 0.06% of this quantity, respectively.

4.2.4.4.2 Brawley Wetland. At the Brawley wetland site, water is withdrawn from the New River at a rate of about 7 ac-ft/yr (2.74×10^{-4} m^3/s). No flow measurements have been made at the Brawley wetland site; however, one can conservatively assume that the flow at this location is the same as at the upstream Calexico gage (flow increases in the New River in the downstream direction). For average conditions, the water demand for the Brawley site is about 0.004% of the flow at the Calexico gage.

The low, average, and high annual flows for the New River at the Calexico gage are about 118,000, 180,000, and 264,000 ac-ft/yr (4.62, 7.04, and 10.33 m^3/s), respectively. Even under conditions of the lowest annual flow, the combined consumptive use of water by the power plants would be less than 10% of the flow in the New River (Section 4.2.4.1.1). These flow reductions due to plant operation should not prevent the withdrawal of the water required for the Brawley wetland by the existing pump.

Even with reduced annual loads to the New River, operation of the two power plants would increase the TDS in the river at the Calexico gage by less than about 6% and increase the selenium concentration by about 6%. These increases would occur because of a reduced volume of water flowing in the river. Decreased concentrations would occur for TSS, BOD, COD, and phosphorus (–2.3%, –5.8%, –17.0%, and –7.5%, respectively [Table 4.2-5]). Increases in TDS and selenium concentrations should not exceed the tolerance of wetland plants (Section 4.4.4.2), whereas the changes in other water quality parameters could be beneficial (Section 4.4.4.3). In all cases, the changes would be within the range of the parameters' variability.

4.2.4.5 Indirect Impacts to Groundwater

Indirect impacts to groundwater would occur as a result of decreasing flow in the New River, since the New River is a recharge source for groundwater in the Imperial Valley Groundwater Basin. However, since the New River is only one of many recharge sources (contributing about 7,000 ac-ft/yr [0.25 m^3/s]) and the reduction of flow is expected to be low (about 5.9% and 2.3% of the annual flow at the Calexico and Westmorland gages, respectively), the impacts to groundwater resources resulting from the proposed action are expected to be minimal.

4.2.5 Alternative Technologies

This section discusses impacts to water resources from the use of an alternative cooling technology (wet-dry cooling). Impacts from the use of more efficient emission controls would be the same as those for the proposed action and therefore are not discussed in this section.

With wet-dry cooling, dry cooling would be used on days for which the air temperature was sufficiently low to promote efficient cooling. For hotter days, the system would use wet cooling. For the sake of conservatism, wet cooling was assumed for days on which the temperature exceeded 90°F (32°C). In the area of Mexicali, Mexico, approximately 44% of the days (approximately 161 days annually) have temperatures that exceed 90°F (32°C). Calculations to estimate the impacts of a wet-dry cooling system on TDS for the New River at the Calexico gage at the U.S. Mexico border were made for the following assumptions: wet cooling would be used 44% of the time; annual water withdrawals for both plants operating would be the same as for the proposed action (Table 4.2-2); 20% of the water during the wet portion of the cycle would be returned to the New River via the drains (793 and 402 ac-ft/yr for the LRPC and TDM plants, respectively); the concentration of TDS in the plant discharge water would be the same as for the proposed action (4,800 and 4,430 mg/L for the LRPC and TDM plants, respectively); and the bioreactor would continue to operate during the dry portion of the cycle, but very little TDS would be removed (for simplicity, assumed to be equal to zero removal). For these conditions, the concentration of TDS in the New River at the Calexico gage would be about 2,683 mg/L. This value is about 83 mg/L less than the TDS predicted for the proposed action and would represent an increase of about 2% over the base case in which no plants would be operating. The proposed action would produce an increase of about three times more, that is, 6%. A similar calculation for BOD shows that the wet-dry system would produce a BOD in the New River at the Calexico gage of 25.4 mg/L, while the proposed action would produce a BOD of 25.9 mg/L. For this calculation, BOD removal is assumed to occur only within the bioreactor step of the water treatment process.

4.2.6 Mitigation Measures

4.2.6.1 Water Resources

Mitigation for water resources would focus on potential measures that could be implemented in the United States to offset increased TDS concentrations in the Salton Sea and/or New River resulting from reduced flow volumes in the New River due to power plant operations. Similar actions could also be potentially undertaken in Mexico. Potential measures could include, but are not limited to, lining irrigation canals to reduce seepage, reducing the amount of evaporation from irrigation canals, fallowing farm land, pumping groundwater from shallow aquifers to the New River or the Salton Sea, and annually removing a portion of the water in the Salton Sea or diking an area of the Sea to achieve evaporation losses equal to the loss of water from the New River due to power plant operations. The following discussion investigates the technical feasibility and cost of implementing these strategies.

Lining Canals: As part of a long-term program (costing at least $295 million) with other water agencies in California, the IID has developed a water conservation plan that includes land fallowing, improvements to on-farm irrigation systems and improved water delivery systems. Water delivery system improvements have focused on lining canals and laterals with concrete, constructing reservoirs and interceptor canals, and recovering canal seepage. These measures have resulted in a savings of approximately 106,000 ac ft/yr (4.1-m^3/s) of water (IID 2004a).

Between 1954 and 1989, 910 mi (1,465 km) of canal were lined, resulting in an annual water savings of 58,000 ac ft (71.5 million $m^{3)}$ of water. The IID reports that there are 230 mi (370 km) of main canals; 1,438 mi (2,314 km) of canals and laterals, of which 1,109 mi (1,785 km) are concrete-lined or pipelined; and 1,406 mi (2,263 km) of drainage ditches in the Imperial Valley (IID 2004b). As discussed in Section 4.2.4, the annual loss of water under the proposed action (both power plants operating 100% of the time) would be 10,667 ac ft (0.41 m^3/s). This loss of water could be offset by installing concrete lining on approximately 167 mi (269 km) of canals, assuming a seepage rate from the canals of about 3.7 ac ft/mi (2,840 m^3/km).

Concrete liners are estimated to cost approximately \$2.00 ft^2 (GMA 2004). Lining 167 mi (269 km) of canal with a surface area of 10-ft^2/linear foot (3 m^2/m) would cost about \$18 million or about \$1,650 per ac ft (\$1.34/ m^3) of water conserved. With time, concrete liners crack and water losses increase. An aged system can lose as much as 30% of its water to seepage through cracks. This loss of efficiency can be reduced by adding a synthetic liner to the system. Such liners can increase construction costs by \$0.50/ft^2 (\$5.38/m^2). With a synthetic liner on top of the concrete, the cost for lining 167 mi (269 km) of canal with a surface area of 10 ft^2/linear foot (3.05 m^2/m) would be about \$22 million.

While the above analysis has identified potential measures to conserve water, water conservation through lining of canals and laterals would not necessarily reach the Salton Sea or provide mitigation for the proposed project. Water delivered to the IID from the Colorado River for irrigation purposes must be put to that use. Water saved may instead remain in storage on the Colorado River as it would not be needed for agricultural production within the IID. In addition, previous analyses of canal, lateral, and drainage ditch lining proposals on the IID have raised concerns regarding potential impacts to species, including the desert pupfish, protected by Federal and California Endangered Species Acts. This analysis does not include any costs associated with compliance with these and other applicable statutes, such as the California Environmental Quality Act, or potential impacts associated with possible temporary disruption of water service. Improvements in on-farm efficiencies also raise concerns as such actions often result in less wastewater runoff from farmland, thereby causing a reduction of inflow to the Salton Sea.

Reducing Evaporative Losses: As discussed in Appendix F, evaporative losses in the Salton Sea watershed are approximately 5.7 ft/yr (1.74 m/yr). Assuming that drainage canals have a width of about 10 ft (3 m) and that there are about 1,667 mi (2,683 km) of canals and laterals in the IID system, the average annual loss of water in the drainage canals due to evaporation is about 11,600 ac ft (0.41 m^3/s). To fully offset the 10,667 ac ft (0.41 m^3/s) of water annually due to the proposed action through a reduction of evaporative losses, most of the canal system would have to be replaced with pipe. These activities would be expected to have substantial environmental impacts, including land disturbance and endangered species issues, at significant cost. Because reducing the seepage from the canals would save much more water (by a factor of about 10), seepage control would be a more reasonable approach than reducing evaporation.

Fallowing Farmland: In 2001, about 521,850 acres (211,190 ha) of land in Imperial Valley were irrigated for agricultural purposes: 417,930 acres (169,130 ha) for field crops, 81,570 acres (33,010 ha) for garden crops, and 22,350 acres (9,045 ha) for permanent crops (IID 2004c). The area of land needed for fallowing to offset water reductions due to the proposed action would depend on the particular crop being grown since irrigation needs vary by crop. For example, alfalfa, a major crop produced in the Imperial Valley, requires about 6 ac ft of water per acre (18,290 m^3/ha) of irrigated land per year. Assuming that the fallowed land would be used to raise alfalfa, approximately 1,780 acres (720 ha) of land would need to be fallowed to offset water consumption by the two power plants. However, if the selected crop were corn, which requires about a third of the water required for alfalfa (about 2 ac ft/yr[7.7×10^{-5} m^3/s]), about 5,340 acres (2,160 ha) of land would need to be fallowed. In 2001, the total cash value for the top 10 crops in Imperial Valley was about $681 million (IID 2004b). With 521,850 irrigated acres (211,190 ha), the cash value per acre is about $1,305. If the actual cost for fallowing were equal to the cash value per acre, fallowing 1,780 to 5,340 acres (720 to 2,160 ha) would cost about $2.4 million to $7 million annually. This cost would be incurred for the lifetime of power plant operations. Fallowing of land within IID as a water conservation measure, however, has previously raised significant socioeconomic concerns and secondary impacts among the farming and nonfarming communities within the IID and the surrounding area.

Groundwater Transfer: Groundwater wells could be installed to pump groundwater to the New River or the Salton Sea directly. This could be accomplished by pumping 30 wells at 220 gal/min (830 L/min), possibly at Imperial East Mesa, southeast of the Sea (DOI 1974). Detailed studies would be required to determine whether this pumping rate could be achieved and sustained for the term of the project. In general, groundwater in the Imperial Valley basin occurs in two major aquifers (California Department of Water Resources 2004a). It should be noted that because this water has a relatively high TDS content, in the range of 498 to 7,280 mg/L, pumping groundwater to the Salton Sea could result in adverse impacts to its salinity concentrations. According to the results of a groundwater model that used data from 1970 to 1990 (California Department of Water Resources 2004a), the groundwater system beneath Imperial Valley is losing about 17,000 ac ft/yr (0.66 m^3/s). Because the groundwater system is already declining, it is unlikely that additional withdrawals would be an effective and feasible mitigation alternative.

Salton Sea Mitigation Strategies: Offsets could possibly be achieved by installing a dike in the Salton Sea or removing a volume of water at its current TDS level of 44,000 mg/L and allowing the New River to flow into the Sea with its lower TDS concentration. If the water were removed from the Sea to evaporation ponds (e.g., at Paden Dry Lakes, northeast of the Sea [DOI 1974]), the annual quantity of Salton Sea water that would have to be removed would have to equal the 10,677-ac ft/yr (0.41-m^3/s) reductions due to power plant operations. Removing an equivalent amount of Salton Sea water on an annual basis would prevent the concentration of salt in the Sea that would, without this mitigating action, occur if the Salton Sea were to achieve a new water surface equilibrium resulting from the 10,667-ac ft/yr (0.41-m^3/s) reduction in inflow. At the evaporation ponds, the high TDS water would be allowed to evaporate, leaving salt deposits that would need to be removed. This mitigation strategy would involve substantial annual costs in pumping water from the Sea to an evaporation pond and then removing the evaporated residuals. The permitting process for such a strategy is also expected to be complex.

If a dike were installed in the Salton Sea, the area to be diked off would have to reduce annual evaporation in the main body of the Sea by 10,677 ac ft/yr (0.41-m^3/s). This reduction in area would allow the main body of the Salton Sea to maintain an equilibrium in water surface elevation and would prevent the concentration of salt in the Sea that would, without this mitigating action, occur if the Sea were to achieve a new water surface equilibrium resulting from the 10,677-ac ft/yr (0.41-m^3/s) reduction in inflow. This diked-off area would be considerably less than the current North Lake Plan endorsed by the Salton Sea Authority that would involve constructing an 8.5-mi (13.7-km) long dam to divide the Salton Sea in half. Implementation of this strategy would be costly and complex and would have to be coordinated with the Salton Sea Authority's ongoing restoration project activities. Additional studies would be needed to evaluate the effectiveness of this mitigation measure to the Salton Sea.

Summary: It is important to note that while the conservation measures described above (lining canals, reducing evaporative losses, and fallowing farmland) would yield water savings, it is not reasonable to assume that the IID would be interested in undertaking such a project at this time given the extensive water conservation measures it is currently undertaking for the Quantification Settlement Agreement (QSA) and the significant financial, legal, environmental, and policy issues involved. Given these considerations, along with the limitations of the groundwater transfer (due to the declining status of groundwater in the area and its potentially high TDS concentrations) and the administrative complexities associated with removing water from the Salton Sea or building a dike within it, it is possible that none of the mitigation measures described can be readily implemented. In addition, impacts from other projects that are not being mitigated (e.g., the Mexicali II Wastewater Treatment Plant) and the reductions in Colorado River flow into Mexico, resulting in less water ultimately flowing back into the United States via the New and Alamo Rivers, would overwhelm the beneficial impacts of any mitigation efforts associated with this proposed project.

4.2.6.2 Air Quality

Mitigation measures for reducing air impacts, such as paving 22 mi (35 km) of dirt roads and construction of fast-fill compressed natural gas stations, could result in impacts related to soil erosion, thus increasing, at least temporarily, the sediment loads to nearby water bodies. Over the long term, paving roads and other surfaces subject to frequent physical disturbance would reduce erosion (and thus potentially reduce sediment discharge to streams). When it rains in the desert, little water penetrates (almost all of it runs off), so the effect of paving on surface runoff is negligible.

4.3 AIR QUALITY

This section analyzes the impacts of the alternatives described in Chapter 2 on air quality in the United States. Impacts in the United States may be a direct result of the air emissions produced during the construction and maintenance of the proposed transmission lines in the United States. This section also analyzes the impacts in the United States that may result from operations of the LRPC and TDM power plants.

4.3.1 Major Issues

Major issues pertaining to air quality include the following:

- Impacts in the United States of NH_3 emissions from the TDM and LRPC power plants and their contribution to secondary particulate formation;
- Impacts in the United States of CO_2 emissions from the TDM and LRPC power plants;
- Quantification of impacts during the phased SCR installation on Mexico-dedicated turbines at the LRPC;
- Concern that air emissions from the TDM and LRPC power plants could exacerbate the health impacts in the United States currently linked to regional air quality;
- Mitigation of impacts of emissions from the TDM and LRPC power plants by instituting offsets;
- Use of EPA significant impact levels (SLs), taken from the CAA as benchmarks of impacts of power plant emissions;
- Analysis of Alternative 3 emission control technology options in terms of a retrofit of the existing power plants;
- Analysis of the sensitivity of O_3 modeling to changes in input values; and
- Analysis of additional PM_{10} emissions from exposed Salton Sea lakebed resulting from water consumption by the power plants.

These issues are addressed in this section, except for health impacts, which are addressed in Section 4.11.

4.3.2 Methodology

This section describes the methodologies for estimating emissions from the construction and operation of the Sempra and Intergen transmission lines and from the operation of the TDM and LRPC power plants in Mexico.

4.3.2.1 Estimating Emissions from Transmission Line Construction and Operation

Fugitive particulate (PM_{10}) emissions (dust) were estimated for transmission line construction. Emission factors for unpaved roads and construction areas were taken from

"Volume I: Stationary Sources" from the document, *AP-42: Compilation of Air Pollutant Emission Factors*, commonly referred to as "AP-42," published by the EPA (1998a). AP-42 provides guidance for estimating fugitive emissions when source-specific emission information is not available. The emission factor for estimating fugitive PM_{10} from unpaved roads is based on an empirical equation that includes the following variables: silt content of the parent soil, average vehicle weight in tons, and surface material moisture under natural conditions. The emission factor yielded is in pounds of PM_{10} per vehicle-mile traveled (VMT). The method for estimating emissions for vehicular travel during transmission tower construction uses generic assumptions for these variables, including a surface soil silt content of 23%, average vehicle weight of 2.2 tons (2 t), and a surface soil moisture during construction of 0.2%. The number of days with measurable rain (greater than 0.01 in. [0.03 cm]) is also taken into account, and the estimate reflects that construction would take place during the rainy season (i.e., winter). The estimated fugitive PM_{10} emissions from construction of four pads for each tower were estimated using emission factors developed by the California South Coast Air Quality Management District (1993). Emissions from helicopter operations to transport completed tower sections were similarly estimated. Emissions from subsequent maintenance and inspection activities along the transmission lines were also derived.

4.3.2.2 Estimating Air Pollutant Concentrations from Power Plant Emissions

The values for the LRPC and the TDM plants were obtained from a combination of the maximum levels described in the Mexico permits (for NO_x and CO), vendor guarantees (for NH_3 slip), vendor estimates (for PM_{10}), and stoichiometric calculations by Sempra and Intergen on the basis of the amounts of natural gas burned for CO_2. Maximum theoretical emission levels were based on operating at full power 24 hours per day, 365 days per year. The actual operation of the plants and the resulting emissions would be less because of scheduled maintenance, forced outages, and varying electrical demands by California.

4.3.2.2.1 Nitrogen Dioxide, Carbon Monoxide, Ammonia, and Particulate Matter. DOE and BLM have used the EPA's AERMOD (the American Meteorological Society [AMS/EPA Regulatory MODel]) (EPA 1998b) to calculate increments in air pollutant concentrations (NO_2, CO, NH_3, PM_{10}) in the United States as a result of emissions from the TDM and LRPC plants. AERMOD is a steady-state plume dispersion model for assessing pollutant concentrations from a variety of sources. This model serves as a replacement for ISCST3 (Industrial Source Complex Short Term Dispersion Model 3), which was designed to support the EPA's regulatory modeling. AERMOD simulates transport and dispersion from flat and complex terrain, surface and elevated releases, and multiple sources. It can be applied to rural and urban areas. It is based on an up-to-date characterization of the atmospheric boundary layer and accounts for building wake effects and plume downwash. The model uses hourly sequential preprocessed meteorological data to estimate concentrations for averaging times from 1 hour to 1 year.

AERMOD is actually a modeling system with three separate components: AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD Terrain Preprocessor), and AERMET

(AERMOD Meteorological Preprocessor). Special features of AERMOD include its ability to treat the vertical inhomogeneity of the planetary boundary layer, surface releases, and irregularly shaped area sources, and limitations on vertical mixing in the stable boundary layer. It also includes a three-plume model for the convective boundary layer, and it fixes the reflecting surface at the stack base. A treatment of dispersion in the presence of intermediate and complex terrain is used, which improves on that currently in use in other models. To the extent practicable, the structure of the input or the control file for AERMOD is the same as that for the ISCST3. At this time, the AERMOD contains the same algorithms for building downwash as those found in the ISCST3 model.

AERMET is the meteorological preprocessor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations, and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters. AERMAP is a terrain preprocessor designed to simplify and standardize the input of terrain data for AERMOD. Input data include receptor terrain elevation data. Output data include the location and height scale for each receptor, which are the elevations used for the computation of airflow around hills.

The emission rates and stack parameters used are shown in Appendix G. All stack emissions were considered to be released as point sources, and emissions from cooling towers were assumed to be volume sources.

The following meteorological data were used for AERMET: hourly surface meteorological data from Imperial County Airport, California (17 ft [5 m] measurement height up to August 15, 2000, and 33 ft [10 m] thereafter), and upper air sounding data from Miramar, San Diego, California. Imperial meteorological data were obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center for the 10-year period 1993 to 2002; AERMOD was run with 5 years of data, namely, 1993, 1994, 1995, 1998, and 1999.

A center point for each plant (i.e., the center of the TDM plant and the center of the LRPC plant) was determined, and a receptor grid was established as follows: 820-ft (250-m) grids up to 16,404 ft (5,000 m) from the center, 1,640-ft (500-m) grids from 16,404 to 32,808 ft (5,000 to 10,000 m) from the center, 3,281-ft (1,000-m) grids from 32,808 to 82,021 ft (10,000 to 25,000 m) from the center, and 656-ft (200-m) interval grids on the U.S.-Mexico border. This yielded a 31-mi × 31-mi (50-km × 50-km) modeling domain. The highest concentration among receptor grid locations for each averaging time was selected as the reported modeled concentration.

4.3.2.2.2 Ozone. Regulatory review requirements in the United States and Mexico do not include the photochemical modeling of O_3. Nevertheless, the potential influence of the TDM and LRPC plants on O_3 levels in the region that may result from their emissions was investigated. The Ozone Isopleth Plotting Program Revised (OZIPR) model was used to estimate possible incremental O_3 formation resulting from precursor NO_x and VOC emissions from the power plants in Mexico. OZIPR is based on EPA's Ozone Isopleth Plotting Program (OZIPP) model.

OZIPR is a single-day one-dimensional photochemical box transport model that focuses on the atmospheric chemistry that leads to O_3 formation. It is a simple trajectory model capable of utilizing complex chemical mechanisms, emissions, and various meteorological parameters of the lower atmosphere. Its physical representation is a well-mixed column of air extending from the ground to the top of the mixed layer. This idealized air column moves with the wind (along the wind trajectory) but cannot expand horizontally. Emissions from the surface are included as the air column passes over different emission sources, and air from above the column is mixed in as the inversion rises during the day. Complex chemical mechanisms may be input into OZIPR to describe the chemical processes that occur within this modeled air mass. In addition to individual trajectory simulations, the program can use the Empirical Kinetic Modeling Approach (EKMA) to estimate O_3 levels from different types and amounts of precursor emissions.

In general, a wide spectrum of air quality models, including the Gaussian plume model, Lagrangian puff model, and Eulerian model, are available for relatively inert pollutants, such as CO or SO_2. However, simulation of O_3 formation and transport is a highly complex and resource-intensive exercise. Control agencies are encouraged to use three-dimensional Eulerian photochemical grid models, such as the Models-3/Community Multi-scale Air Quality (CMAQ) model, to evaluate the relationship between precursor emissions and O_3. As a choice of models to complement photochemical grid models, EKMA, which is implemented by the OZIPR model, may be used to help in formulating strategies for simulation with a photochemical grid model and in corroborating results obtained with a grid model. Considering the magnitude of O_3 precursor emissions in the area, ambient O_3 impacts from the power plants are expected to be small. Accordingly, a screening type of model meets the needs of the objectives of this EIS; namely, to understand the nature and general magnitude of impacts of plant operations on O_3 production in the region. An analysis of the sensitivity of the results of the model to changes in inputs was performed, and the model performance has been determined to meet the needs of this analysis. The sensitivity analysis is discussed later in this section.

4.3.2.2.3 Carbon Dioxide. The emissions of CO_2 from the TDM plant, LRPC export turbines, and LRPC Mexico turbines were compared with both the total U.S. emissions from fossil fuel combustion and total global emissions from fossil fuel combustion.

4.3.2.2.4 Volatile Organic Compounds. VOC emission inventory data were obtained for the Imperial Valley area from the ARB (ARB 2003b) and for the Mexicali area (ERG et al. 2003) as discussed in Section 4.3.4.4.2. VOC emissions for the turbines at the TDM and the LRPC facilities were conservatively estimated by using an emission factor of 0.02 lb/MMBtu provided by the facilities, which is about four times higher than the emission factor for natural gas combustion from EPA AP-42 (EPA 1998a). These data were drawn upon in the analysis and discussion of O_3 formation in Section 4.3.4.4.2.

4.3.2.2.5 Secondary PM_{10} from Ammonia. DOE and BLM estimated the amount of secondary PM_{10} ammonium nitrate (NH_4NO_3) that could be formed by the chemical reaction between ambient NH_3 and nitric acid (HNO_3) originating from NO_x emitted from the Mexico power plants. This methodology was based on a production term of 0.6 g of NH_4NO_3 from 1.0 g of emitted NO_x, a term that was derived by Stockwell et al. (2000) for wintertime conditions in the San Joaquin Valley. As is discussed in much fuller detail in Section 4.3.4.4.2, because of higher temperatures and lower relative humidities in the Imperial Valley-Mexicali area, this term was believed to overestimate the amounts of NH_4NO_3 formed. Comparisons were made to measurements made by Chow and Watson (1995) of secondary NH_4NO_3 contributions to total PM_{10} (from all sources) in the Imperial Valley-Mexicali area. These were low, in the range of 2 $\mu g/m^3$ to 3 $\mu g/m^3$, or about 1 to 2% of total PM_{10}, adding corroborating evidence that the amount of secondary NH_4NO_3 particulates contributed by the power plants would be very small.

4.3.2.2.6 Hazardous Air Pollutants (HAPs). In the United States, the EPA promulgated the Combustion Turbine National Emissions Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR 63 Subpart YYYY, which is also referred to as the "Combustion Turbine MACT." This maximum achievable control technology (MACT) standard was published in the *Federal Register* on March 5, 2004 (69 FR 10512). However, on April 7, 2004, the EPA published a proposed rule to delist four subcategories of gas-fired stationary combustion turbines from the "Combustion Turbine MACT" rule (69 FR 18327). In a companion action, the EPA proposed to stay the effectiveness of this rule for lean premix gas-fired turbines (and one other subcategory) prior to their delisting in a final rule that may ensue. Both the Siemens-Westinghouse Model W501F combustion turbines at the LRPC and the General Electric Model 7FA combustion turbines at TDM are lean premix gas-fired turbines. If these combustion turbines were operated in the United States, they would be delisted from the "Combustion Turbine MACT" (i.e., it would not apply).

MACT

Maximum achievable control technology (MACT) standards only apply to emission units at a major source of HAPs. To be considered a major source of HAPs, a facility has to emit or have the potential to emit any single HAP at a rate of 10 tons (9 t) or more per year or any combination of HAPs at a rate of 25 tons (23 t) or more per year.

Notwithstanding, DOE and BLM have estimated HAP emissions for the LRPC and TDM as shown in Appendix H, which provides a full health risk assessment of HAP emissions from the LRPC and TDM. HAP emissions from the four turbines (export and nonexport) at the LRPC that do not have oxidizing catalysts were estimated to be 35.2 tons/yr (31.9 t/yr). HAP emissions from the two combustion turbines at TDM, which have oxidizing catalysts installed, were estimated to be 9.9 tons/yr (8.9 t/yr). The oxidizing catalysts at TDM were assumed to have a control efficiency of at least 50% in controlling HAP emissions from these units. The potential health risks due to the HAPs and NH_3 emissions are discussed in Section 4.11.

4.3.2.2.7 Emissions Excluded from Further Analysis. A key element of the CEQ's NEPA regulations (40 CFR 1502 and 1502.2) involved focusing on significant environmental issues and discussing impacts in proportion to their significance. Consistent with that "sliding scale" approach, the following issues were considered, reviewed, and then excluded from further analysis.

Sulfur dioxide (SO_2). Natural gas contains almost no sulfur or nitrogen. For example, U.S. coal contains an average of 1.6% sulfur, and oil burned at electric utility power plants ranges from 0.5 to 1.4% sulfur. Comparatively, natural gas at the burner tip has less than 0.0005% sulfur, mainly in the form of hydrogen sulfide (H_2S). Thus the burning of natural gas in the TDM and LRPC combined-cycle turbine units reduces many of the emission impacts that are associated with fuels such as coal, oil, or biomass. Forty tons/yr (36 t/yr of SO_2 emissions are estimated to result from the power plants associated with the proposed action (i.e., from the two TDM turbines, and the EBC and EAX export units at the LRPC), 30 tons/yr (27 t/yr) from the no action alternative (i.e., the three EAX turbines at the LRPC), and 60 tons/yr (54 t/yr) from all of the TDM and LRPC turbines (i.e., the two TDM turbines and the EBC and two EAX units at LRPC). These amounts would correspond to approximately a maximum impact in the United States of 0.005 $\mu g/m^3$ annually for the proposed action and 0.004 $\mu g/m^3$ annually for the no action alternative, compared to an EPA annual SL of 1.0 $\mu g/m^3$. The amounts of SO_2 emitted are about 0.00025% and 0.00018% of the total amount of the approximately 15,000,000 tons/yr (13,600,000 t/yr) of SO_2 emissions in the United States. By virtue of the de minimis nature of these SO_2 emissions, no further analysis of their impacts was pursued.

Lead (Pb). Lead is not known to be emitted from the burning of natural gas. There are no known emissions of the criteria air pollutant Pb from the TDM or LRPC power plants, and no further analysis of lead impacts is pursued in this EIS.

Acidic deposition. Acidic deposition, commonly referred to as "acid rain," describes the wet deposition of any hydrometeor (rain, snow, or fog) with a pH below 5.5[1] and the dry deposition of acidic gases or particulates. The major causes of "acid rain" are SO_2 emissions and to a lesser extent NO_x emissions. SO_2 and NO_x can be converted to sulfuric acid or nitric acid in the atmosphere, scavenged in water droplets, and deposited as "acid rain." Acid particulates or gases can also be dry deposited. Acidic deposition is deleterious to aquatic resources, plants, forests, structures and materials, animal species, and ultimately human health. It is a large-scale regional issue; that is, impacts can result from emissions hundreds and hundreds of miles away. The greatest impacts occur in the northeastern United States. The maximum emissions from the proposed action of 40 tons/yr (36 t/yr) of SO_2 (estimated) and 420 tons/yr (380 t/yr) of NO_x (Table 4.3-1b) represent approximately 0.00025% of the total amount of the approximately 16,000,000 tons/yr (14,500,000 t/yr) of SO_2 emissions in the United States (EPA 2003e) and 0.002% of the approximately 22,000,000 tons/yr (20,000,000 t/yr) of annual NO_x emissions. By virtue of this de minimis attribute as well as minimal NO_2 concentration levels shown to result from the proposed action at a maximum receptor point in the United States (Table 4.3-2), no further analysis of acidic deposition was pursued.

Visibility. SO_2 and NO_x emissions from power plants can form sulfates and nitrates, respectively, which can contribute to regional haze and visibility degradation. EPA Prevention of Significant Deterioration Regulations call for review of such degradation in Class I areas within

[1] "Acid rain" in the Northeast United States has a pH as low as 4.3.

62 mi (100 km) of a major source. Although these regulations do not apply to the TDM and LRPC plants in Mexico, their guidelines were adopted as a screening tool to benchmark impact. As has been discussed, only very low levels of SO_2 would be emitted from the TDM and LRPC plants in Mexico, and either would not be construed as a major source for SO_2. As described in Section 3.3.2, the nearest Class I area at the Agua Tibia Wilderness is located in the Cleveland National Forest, about 85 mi (137 km) to the northwest. The maximum allowable increment for a Class I area for NO_2 is 2.5 $\mu g/m^3$ annually. The proposed action results in a maximum annual NO_2 increment in the United States at a receptor point under 6 m (10 km) from the source that is some 50 times less (0.05 $\mu g/m^3$ [Table 4.3-4]). For these reasons, no further analysis of impacts on visibility degradation was pursued.

4.3.3 No Action

Under the no action alternative, the Presidential permits and ROW applications would be denied, and no lines would be built. Therefore, there would be no air quality impacts in the United States from the construction and operation of the lines. For the purposes of the air impacts analysis, it was assumed that the TDM plant, which would use the proposed transmission lines and would have no other outlet for power, would not operate or produce emissions. Impacts in the United States attributed to the TDM plant would be zero.

Under the no action alternative, the EBC unit also would not operate and would produce no emissions. However, electrical output of the entire EAX unit would operate because it would be connected to the CFE system and would export power to the United States over the existing IV-La Rosita line. Therefore, air impacts in the United States would occur. The impacts of operation of the TDM and LRPC plants are presented in Section 4.3.4 as part of the proposed action.

Impacts to air quality under the no action alternative are summarized in Table 4.3-5. This table shows that increases in concentrations of emitted pollutants would not exceed EPA SLs used as benchmarks of impacts at any receptor location in the United States. These results and the secondary air pollutants formed from primary emissions from the plants are presented in detail in Section 4.3.4.

4.3.4 Proposed Action

Under this alternative, Presidential permits would be granted by DOE and corresponding ROWs by BLM, the Sempra and Intergen transmission lines would be constructed simultaneously by the same contractor for transmission of power from the U.S.-Mexico border to the IV Substation in Imperial County, and the TDM power plant and the export turbines at the LRCP power plant would be operated. The impacts of this proposed action alternative are described below.

4.3.4.1 Impacts from Transmission Line Construction

The proposed transmission lines would be constructed from December through April in order to accommodate BLM's administration of the flat-tailed horned lizard protection program. Construction of the transmission lines would involve setting foundations, which would require the movement of equipment along the routes, as well as the placement of the steel lattice towers by helicopter. The primary equipment to be used in setting foundations would be cement trucks, pickup trucks, and small construction equipment such as backhoes and skip loaders for excavation.

The amount of fugitive dust generated by these sources would depend upon several factors. However, the dust generated by entrainment on vehicle wheels is typically temporary in nature and settles in the immediate vicinity. Such fugitive dust emissions would not materially affect ambient PM_{10} levels in the project region. Water sprayed from truck-mounted equipment would be used sparingly for dust control at access roads, work areas, and when helicopters would be in use at tower sites. Any impacts would be temporary in nature.

Maximum fugitive PM_{10} emissions were estimated from transmission line construction. Conservatively high emission factors for estimating fugitive PM_{10} from unpaved roads (EPA 1998a) were used to estimate the maximum PM_{10} emissions that could occur during line construction. Estimates were based on an empirical equation that includes the following variables: silt content of the parent soil, the average vehicle weight in tons, and surface material moisture under natural conditions. Pounds of PM_{10} per VMT were estimated. The estimated emissions for vehicular travel along the unpaved access roads along the existing SDG&E ROW during transmission tower construction include generic assumptions for these variables, including an average soil silt loading of 23%, average vehicle weight of 2.2 tons (2 t), and surface soil moisture during construction of 0.2%. The number of days with likely measurable rain (greater than 0.01 in. [0.03 cm]) was also taken into account, and the estimate reflects that construction would take place during the time of year during which precipitation in the region generally takes place.

Using AP-42 Section 13.2.2, Equation 1, the estimated emission factor used was 2.15 lb (0.98 kg) of PM_{10} per VMT. It was estimated that 18 round-trips per day during the first two months of construction, 8 round-trips per day during the next month, and 5 round-trips per day during the last 2 months of construction would occur (as discussed below). Assuming that State Route 98 is the take-off point for traffic to the work site and that the maximum distance from Interstate 98 to the construction site (to the north and south) is 3 mi (5 km) (the average distance is 1.5 mi [2.4 km]), the VMT during these trips would be 54, 24, and 15. Therefore, PM_{10} emissions from vehicular traffic to and from the construction site would be 116.1 lb (52.6 kg) of PM_{10} per day for the first two months (54 VMT × 2.15 PM_{10}/VMT), or 3.60 tons (3.3 t); 51.6 lb (23.4 kg) of PM_{10} per day for the next month (24 VMT × 2.15 PM_{10}/VMT), or 0.80 tons (0.73 t); and 32.3 lb (14.6 kg) of PM_{10} per day for the following 2 months of construction (15 VMT × 2.15 PM_{10}/VMT), or 1.00 ton (0.91 t); making a total of 5.40 tons (4.9 t).

Construction equipment, as well as vehicle traffic associated with the movement of construction workers to and from the site, would also cause air emissions resulting from the combustion of fuel. However, the number of construction equipment vehicles to be used on site and the relatively small number of total construction workers commuting to and from the general project site were not expected to result in a substantial impact on air quality. Any air quality impacts associated with this vehicular traffic would also be temporary in nature.

Tower placement would be performed over a 2- to 3-day period. The towers would be picked up from the lay-down area in Mexico and placed at each location by helicopter. The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized area near the tower base. The area of the projects is mostly uninhabited desert. However, to control dust, small quantities of water would be sprayed in the area surrounding the tower locations, as mitigation. Application of water could encourage nonnative invasive plant species to grow and would be used minimally.

The estimated fugitive PM_{10} emissions from pad construction are conservatively estimated to be approximately 26.4 lb (11.9 kg) of PM_{10} per acre per day (South Coast Air Quality Management District 1993). The disturbed area for each pad was less than 0.25 acre (0.10 ha); therefore, during the construction period the estimated PM_{10} emissions would be about 6.6 lb (2.9 kg) per day or less per pad area. Site preparation for each of the 50 tower pad sites (25 per power line) would proceed at a pace of about one and one-half pad sites per day. Thus, up to 9.9 lb (4.5 kg) of PM_{10} per day could be emitted during pad preparation. Site preparation would take about 34 days to complete. Thus, a conservative estimate of PM_{10} emissions from pad preparation would be 0.17 tons (0.15 t).

For the helicopter operations delivering the preconstructed towers from Mexico, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast Air Quality Management District 1993). It was estimated that helicopter operations would last a maximum of 10 hours over a 3-day period. Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Associated construction impacts along the proposed routes — such as grading access roads along the transmission line routes, temporary work areas around each tower, temporary pull sites for transmission line tensioning, and temporary lay-down areas — would be permanently impacted (e.g., tower sites). A total of 9.3 acres (3.8 ha) would be subject to construction activity at some time. Over the construction period, any activity at any individual location would typically be completed in less than a week. However, if it is conservatively assumed that work would extend 1 month (31 days) over 9.3 acres (3.8 ha), then using the AP-42 emission factor of 80 lb (36 kg) (EPA 1998a) of total suspended particulate per day per acre for a construction area and AP-42 factors of 0.5 for PM_{10} and 0.5 for controls, there would be a maximum emission of 2.8 tons (2.5 t) of PM_{10}. To some extent, this value would also overlap the separately derived pad preparation estimate.

There would also be unquantified areas of temporary impact within a 9.5-acre (3.8-ha) construction area of potential effect near the IV Substation. If it is very conservatively assumed that all of this area of potential effect is regarded as a construction site subject to 31 days of activity, 2.9 tons (2.6 t) of PM_{10} would be emitted. This value would be an overestimate.

Thus, the total of PM_{10} emissions over the construction phase of the proposed lines from construction vehicles, pad preparation, helicopter tower placement, and other construction-related activities is conservatively estimated to be a maximum of 11.4 tons (5.40 + 0.17 + 0.11 + 2.8 + 2.9 = 11.4 tons [10.3 t]).

Total PM_{10} emissions from the construction of the western alternative routes and the eastern alternative routes (Figure 2.2-13) were similarly estimated to be 14.4 tons (13.1 t) and 12.3 tons (11.2 t), respectively.

Estimates were derived for VOC and NO_x emissions (precursors to O_3 formation) produced during the course of transmission line construction by vehicular activity, operation of construction equipment, helicopter operations, and workers commuting to the site.

As described earlier, vehicular activity was estimated as 54 VMT per day for 2 months, 24 VMT for 1 month, and 15 VMT for 2 months, yielding a total of 5,022 VMT. Using EPA AP-42 emissions factors (EPA 2004b) for light-duty gasoline-powered trucks of 0.62 g/mi for VOC and 0.789 g/mi for NO_x, 0.003 tons (0.003 t) of VOC and 0.004 tons (0.004 t) of NO_x were estimated to be emitted.

Operation of construction equipment would tend to be sporadic; however, emissions were conservatively estimated to be no greater than those from a 200-brake horsepower (bhp) diesel engine operating for 8 hours a day during the entire 5-month construction period (i.e., 155 days). Applying California diesel standards (ARB 2004a) of 1.00 g/bhp-h for VOC and 5.8 g/bhp-h for NO_x, a total of 0.273 tons (0.243 t) of VOC and 1.59 tons (1.44 t) of NO_x were estimated to be emitted.

Worker commuter activity was conservatively estimated to be the equivalent to no more than 10 workers driving one single-occupant vehicle an average 40-mi (64-km) round-trip every day for the 155-day construction period, that is, an equivalent of 62,000 VMT. Using EPA AP-42 emissions factors (EPA 2004c) for cars of 0.544 g/mi for VOC and 0.592 g/mi for NO_x, 0.037 tons (0.034 t) of VOC and 0.041 tons (0.037 t) of NO_x were estimated to be emitted.

It was estimated that helicopter operations lifting and positioning tower sections would take 2 to 3 days to accomplish and would involve 10 hours of flight time of a jet turbine twin-engine heavy-lift S-64 Aircrane helicopter. This helicopter burns 500 gal (1,890 L) an hour of Jet A fuel (kerosene), that is, a total of 5,000 gal (18,927 L) during construction operations. Using a VOC emission factor of 2.79 kilotons/megaton of Jet A fuel and an NO_x emission factor of 13 kilotons/megaton of Jet A fuel (NAEI 2004), 0.048 tons (0.044 t) of VOC and 0.222 tons (0.201 t) of NO_x were estimated to be emitted.

Thus total VOC emissions during the construction phase of the proposed transmission lines were conservatively estimated to be a maximum of 0.361 tons (0.327 t), and total NO_x

emissions were estimated to be 1.86 tons (1.69 t). VOC and NO_X emission estimates for the western and eastern alternative routes were virtually the same.

4.3.4.2 Impacts from Transmission Line Operations and Maintenance

The newly installed transmission lines would require periodic maintenance of the transmission towers, insulators, and conductors. Operations and maintenance would involve operators driving to the appropriate towers and performing the tasks required. This would generate additional traffic in the area. To assess the scale of emissions, if it is assumed in the course of operations and maintenance that a maximum of two round-trips per month are undertaken along the ungraded roads along the transmission towers, it would follow that 13 lb (6 kg) per month of fugitive PM_{10} would be generated, or approximately a maximum of 0.08 tons (0.07 t) per year.

Likewise, a maximum of 0.10 tons (0.09 t) per year of PM_{10} emissions were estimated to be generated during operations and maintenance for the western alternative routes and 0.088 tons (0.80 t) per year for the eastern alternative routes.

Emissions of NO_X and VOC would be negligible, namely 0.0002 tons (0.0002 t) per year for both, as would also be the case for the western and eastern alternative routes.

Coronal discharge ("corona") can be associated with the operation of high-voltage transmission lines. Because corona represents an adverse energy loss, high-voltage lines, such as the two parallel 6-mi (10-km) stretches of the Sempra and Intergen transmission lines, are designed to minimize it. The primary adverse effect of corona is the production of very small amounts of noise ("buzz" and "crackle") and radio interference. However, corona activity of a transmission line can produce very small amounts of gaseous oxidants in air, mainly O_3 and oxides of nitrogen (NO and NO_2). Localized maximum contributions of O_3 at ground level under the proposed transmission lines during the most favorable conditions for corona formation, which occur during heavy rain, would be orders of magnitude less than ambient levels.

4.3.4.3 Conformity Review

Section 176(c) of the CAA requires that Federal actions conform to the appropriate SIP. The final rule for "Determining Conformity of Federal Actions to State or Federal Implementation Plans" was promulgated by the EPA on November 30, 1993 (58 FR 63214) and took effect on January 31, 1994 (40 CFR Parts 6, 51, and 93). This "Conformity" rule established the conformity criteria and procedures necessary to ensure that Federal actions conform to the SIP and meet the provisions of the CAA. In general, this rule ensures that all criteria air pollutant

> **Maintenance Area**
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> A maintenance area is an area that has been redesignated from nonattainment to attainment of the NAAQS for a criteria air pollutant pursuant to a request submitted by the state to the EPA. At the same time, the state submits a revision to the SIP for a 10-year maintenance plan.

emissions and VOC are specifically identified and accounted for in the SIP's attainment or maintenance demonstration and conform to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. If the action were undertaken in a Federally classified nonattainment or maintenance area, the provisions of the final rule for conformity would apply.

The State of California implements the provisions of the CAA, and this rule was adopted on November 29, 1994, as Rule 925 of the ICAPCD.

The proposed action lies within the PM_{10} and O_3 nonattainment area in Imperial County, and thus the provisions of this rule would apply for those criteria air pollutants. However, actions are exempted when the totals of direct and indirect emissions are below specified emissions levels [40 CFR §51.853(b)1]. The applicable level is 70 tons (64 t) per year for PM_{10} in a serious[2] nonattainment area. VOC and NO_x as precursors to O_3 are governed in an O_3 nonattainment area, and the applicable levels are 100 tons (90 t) per year for both in an O_3 nonattainment area that is not serious or extreme and that is outside an O_3 transport region.

As illustrated in Sections 4.3.4.1 and 4.3.4.2, PM_{10} emissions are considered to be the principal emissions from construction and maintenance of the transmission lines in Imperial County, California, and would total less than 12 tons (11 t) in the year of construction, and much less (0.08 tons/yr [0.07 t/yr]) in subsequent years for maintenance thereafter — amounts that are considerably less than the specified levels of 70 tons/yr (64 t/yr) referenced above. VOC and NO_x emission estimates during the construction phase are much lower, namely 0.361 tons (0.327 t) and 1.86 tons (1.69 t), and are negligible in subsequent years for maintenance thereafter — amounts that are also very much less than the specified levels of 100 tons/yr (90 t/yr) referenced above.

Nevertheless, the provisions of the final rule will apply in a nonattainment area if the emissions of concern are above 10% of this area's total emissions [40 CFR §51.853(i)]. The proposed action is considered to be a "regionally significant action" subject to full conformity analysis if the emissions exceed this 10% threshold. The SIP totals for Imperial County are approximately 24,000 tons/yr (22,000 t/yr) for PM_{10}, 15,000 tons/yr (14,000 t/yr) for VOC, and 17,000 tons/yr (15,000 t/yr) for NO_x (EPA 2004a). The maxima of 11.4 tons/yr (10.3 t/yr) of PM_{10}, 0.361 ton (0.327 t) of VOC, and 1.86 tons (1.69 t) of NO_x estimated to result from construction, and the 0.08 ton/yr (0.07 t/yr) of PM_{10} and the negligible amounts of VOC and NO_x emitted during operation and maintenance of the transmission lines can be seen to be considerably less than 10% of the respective regional emissions. Thus, pursuant to the provisions of 40 CFR §51.853(b)(1) and 40 CFR §51.853(i), the proposed action is exempt from any further review for conformity determination for PM_{10} emissions.

As noted in Sections 4.3.4.1 and 4.3.4.2, PM_{10}, VOC, and NO_x emissions from the construction or operation and maintenance of the western or eastern alternative routes are

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[2] Prior to September 11, 2004, Imperial County was classified as a moderate nonattainment area for PM_{10} (see footnote 3 in Section 3.3.2).

substantially similar to the proposed routes, such that they would be excluded from any general conformity determination (emissions are well below the applicable levels of 70 tons/yr [64 t/yr]).

4.3.4.4 Power Plant Operations

4.3.4.4.1 Annual Emissions. Tables 4.3-1a and 4.3-1b show the estimated maximum annual emissions of criteria pollutants NO_2, CO, NH_3, and PM_{10}. Listed are the annual emissions from the TDM plant and annual emissions from the LRPC EBC and EAX export units, as well as annual emissions from the two EAX units designated for Mexico's electricity market.

Listed are the criteria pollutants NO_2, CO, and PM_{10} that result from the burning of natural gas in the gas-fired turbines and that are emitted via the power plant stacks. Tables 4.3-1a and 4.3-1b list the small amounts of additional PM_{10} that can be emitted from the cooling towers.

TABLE 4.3-1a Criteria Air Pollutants and Other Compounds Emitted from the TDM and LRPC Power Plants: by Turbine[a]

		La Rosita Power Complex		
		Export		Mexico
Pollutants	TDM (two turbines) (tons/yr)	EBC (tons/yr)	One EAX Turbine (tons/yr)	Two EAX Turbines (tons/yr)
Spring 2003 Onward				
CO	181	727	727	1,454
PM_{10} from stack	237	229	229	458
PM_{10} from cooling towers	19	9	9	18
Total PM_{10}	256	238	238	476
CO_2	2,500,000	1,300,000	1,300,000	2,600,000
Through March 2005				
At LRPC, SCR on export EBC and EAX, no SCR on two Mexico EAXs				
NO_2	187	136	95	1,910
NH_3 slip from SCRs	276	148	74	0
March 2005 Onward				
At LRPC, NO_2 SCR added on two Mexico EAXs				
NO_2	187	136	95	190
NH_3 slip from SCRs	276	148	74	148

[a] Very small amounts of NH_3 are emitted from the cooling towers; approximately 1 ton/yr (1 t/yr) per turbine. For simplicity, these amounts are not displayed.

TABLE 4.3-1b Criteria Air Pollutants and Other Compounds Emitted from the TDM and LRPC Power Plants: by Action

Pollutants	No Action: EAX-Export plus Two EAX Mexico Turbines (tons/yr)	Additional Emissions from the Proposed Action: TDM + EBC + EAX-Export[a] (tons/yr)	Cumulative: TDM + All Four LRPC Turbines (export and nonexport) (tons/yr)
Spring 2003 Onward			
CO	2,181	1,635	3,089
PM_{10} from stack	687	695	1,153
PM_{10} from cooling towers	27	37	57
Total PM_{10}	714	732	1,210
CO_2	3,900,000	5,100,000	7,700,000
Through March 2005			
At LRPC, SCR on export EBC and EAX, no SCR on two Mexico EAXs			
NO_2	2,005	418	2,328
NH_3 slip from SCRs	74	498	498
March 2005 Onward			
At LRPC, SCR added on two Mexico EAXs			
NO_2	285	418	608
NH_3 slip from SCRs	222	498	646

[a] The EAX export turbine is included in the emissions for both the no action and proposed action alternative, since it could operate under either one.

Tables 4.3-1a and 4.3-1b also list emissions of other compounds, namely, CO_2, resulting from the burning of natural gas in the gas-fired turbines, and NH_3, from two sources: slip from the SCR process and cooling tower drift evaporation (described in Chapter 2).

Table 4.3-1a lists emissions from all units at the TDM and LRPC plants. Table 4.3-1b lists the aggregate emissions directly associated with the proposed action. These include emissions from the entire TDM plant, the EBC unit, and the EAX export unit, even though power from the latter unit could be transported to the United States over the existing transmission line. Also included are emissions from the no action alternative and from all units at both plants.

4.3.4.4.2 Power Plant Impacts under the Proposed Action. The proposed transmission lines that connect to the IV Substation would transmit power exported from the TDM facility and the EBC and EAX export turbines, respectively. The combined impact of the TDM facility and the LRPC EBC and EAX export turbines upon air pollutant concentration levels at receptor points in the United States was estimated using AERMOD modeling based on the emission data listed in Tables 4.3-1a and 4.3-1b and described in Section 4.3.2.2.1. The impacts of the TDM plant, LRPC EBC and EAX export turbines, and EAX Mexico turbines were also estimated.

The emission rates and stack parameters used in calculating the values in Tables 4.3-1a and 4.3-1b are shown in Appendix G. All power plant operations were assumed to be at full load, that is, operated for 24 hours per day for 365 days per year. All stack emissions were considered to be released as point sources, and emissions from cooling towers were assumed to be volume sources. The effects of building downwash on stack plumes were considered on the emission sources.

The following meteorological data were used in the AERMET module for AERMOD: hourly surface meteorological data from Imperial County Airport, California, and upper air sounding data from Miramar, San Diego, California. Imperial meteorological data were obtained from the NOAA National Climatic Data Center for the 10-year period 1993 to 2002. AERMOD was run for 5 years of data, namely, 1993, 1994, 1995, 1998, and 1999.

A center point (i.e., the center of the TDM and LRPC plants) was determined, and a receptor grid was established as follows: 820-ft (250-m) grids up to 16,404 ft (5,000 m) from the center, 1,640-ft (500-m) grids from 16,404 to 32,808 ft (5,000 to 10,000 m) from the center, 3,281-ft (1,000-m) grids from 32,808 to 82,021 ft (10,000 to 25,000 m) from the center, and 656-ft (200-m) interval grids on the U.S.-Mexico border. This yielded a 31-mi × 31-mi (50-km × 50-km) modeling domain. The first-highest concentration among receptors for each averaging time was selected as the reported modeled concentration.

The AERMOD results calculated from the criteria pollutant emissions at the TDM and LRPC plants are shown in Tables 4.3-2 through 4.3-6. Ammonia gas emissions are discussed under health impacts in Section 4.11.

Secondary PM_{10} Formation

Secondary PM_{10} is formed by chemical reactions in the atmosphere involving precursor air pollutants such as NO_x, SO_2, and organic gases, and other chemical species present in the atmosphere. Secondary PM_{10} formation can extend over hours or days, and thus long-range transport of precursor gases to secondary PM_{10} can also play a role in determining PM_{10} concentrations.

Secondary formation of PM_{10} from plant emissions. PM_{10} in the form of NH_4NO_3 can be produced as a secondary particulate where NH_3 is able to combine with HNO_3 to form NH_4NO_3. Thus DOE and BLM investigated the possible formation of such secondary NH_4NO_3 from NO_x and NH_3 emissions from the TDM and EBC and EAX export units at the LRPC as a result of the proposed action and the maximum impacts in the United States.

However, NH_4NO_3 can only form under certain conditions, namely the presence of NH_3, HNO_3 formed from NO_x, and in favorable meteorological conditions of low temperatures and high relative humidity. A summary of how NH_4NO_3 may be formed follows so that the reader can track the analytical approach that DOE and BLM used to assess how much may be formed in the Imperial Valley-Mexicali area.

TABLE 4.3-2 Criteria Pollutant Increases at a Maximum Receptor Point in the United States Resulting from Emissions from the TDM Turbines

Criteria Pollutant	Averaging Period	Concentration at Maximum United States Receptor[a] (μg/m^3)	Significant Impact Level (SL)[b] (μg/m^3)	NAAQS (μg/m^3)
CO	8-hour	0.046	500	40,000
NO_2	1-hour	2.63	NA[c]	NA
NO_2	Annual	0.0226	1.0	100
NH_3	1-hour	3.9	NA	NA
NH_3	Annual	0.033	NA	NA
PM_{10}	24-hour	2.31	5	150
PM_{10}	Annual	0.046	1.0	50

[a] Results derived from AERMOD modeling.

[b] Benchmark level below which a source is not considered to contribute a significant impact on air quality in this analysis.

[c] NA = not applicable.

NO_x that is emitted from a power plant or from any other source (only about one-third of the NO_x in the atmosphere comes from power plants) can be converted to HNO_3 in two pathways: during the daytime through photochemical processes and at nighttime through heterogeneous chemistry (chemistry occurring between different phases, i.e., between gaseous and solid-liquid particles). NH_4NO_3 can exist in the atmosphere as a particulate. It is formed from NH_3 and HNO_3 and can exist in equilibrium as a particulate in the atmosphere with HNO_3 and NH_3 as gases. This is represented by the reversible reaction:

$$NH_3\ (g) + HNO_3\ (g) \xleftrightarrow{k = f\ (T,\ RH)} HN_4NO_3\ (p),$$

where "(g)" denotes the gas phase, "(p)" is a particulate, and "k" represents the degree to which the chemical species can react, that is, "the equilibrium constant." The equilibrium constant (k) is a function (f) of temperature (T) and relative humidity (RH).

In simple terms, temperature and relative humidity influence how much, if any, NH_4NO_3 is formed from the chemical reaction between NH_3 and HNO_3. As temperature falls and relative humidity rises, NH_4NO_3 particulates will deliquesce (liquefy) into aerosols (very small droplets).

TABLE 4.3-3 Criteria Pollutant Increases at a Maximum Receptor Point in the United States Resulting from Emissions from the LRPC Export Turbines[a]

Criteria Pollutant	Averaging Period	Concentration at Maximum United States Receptor[b] ($\mu g/m^3$)	Significant Impact Level (SL)[c] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO (LRPC turbines without CO oxidizer)	8-hour	3.77	500	40,000
CO (turbines with CO oxidizer)[d]	8-hour	0.470	500	40,000
NO_2	1-hour	5.68	NA[e]	NA
NO_2	Annual	0.051	1.0	100
NH_3	1-hour	3.15	NA	NA
NH_3	Annual	0.028	NA	NA
PM_{10}	24-hour	1.76	5	150
PM_{10}	Annual	0.0677	1.0	50

[a] EBC export turbine plus the EAX export turbine, both equipped with SCR.

[b] Results derived from AERMOD modeling.

[c] Benchmark level below which a source is not considered to contribute a significant impact on air quality in this analysis.

[d] For analysis of the alternative technologies alternative.

[e] NA = not applicable.

Thus, how much NH_4NO_3 particulate is formed depends on:

- The amount of HNO_3 at equilibrium, which in turn depends on how much NO_x is available, that is, that which is emitted from the power plants plus that which is already there;
- The amount of NH_3 that is available from the power plants and other sources; and
- Conditions where low temperatures (T) and high relative humidity (RH) occur.

If the background concentrations of ambient NH_3 and HNO_3 were known, NH_4NO_3 levels as a result of the operations of the power plants could be estimated also. Unfortunately, in common with much of the United States, they are not. Stockwell et al. (2000) were able to derive a production term of 0.6 g of NH_4NO_3 from 1.0 g of NO_x emitted. However, this term was derived only for wintertime conditions in the San Joaquin Valley (the only season where the formation of secondary particulates is a problem there) where temperatures are low and relative

TABLE 4.3-4 Criteria Pollutant Increases at a Maximum Receptor Point in the United States Resulting from Emissions from TDM Plus LRPC Export Turbines — Proposed Action Alternative[a]

Criteria Pollutant	Averaging Period	Concentration at Maximum United States Receptor[b] ($\mu g/m^3$)	Significant Impact Level (SL)[c] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO (LRPC turbines without CO oxidizer)	8-hour	3.92	500	40,000
CO (turbines with CO oxidizer)[d]	8-hour	0.647	500	40,000
NO_2	1-hour	3.76	NA[e]	NA
NO_2	Annual	0.0542	1.0	100
NH_3	1-hour	4.05	NA	NA
NH_3	Annual	0.061	NA	NA
PM_{10}	24-hour	2.45	5	150
PM_{10}	Annual	0.11	1.0	50

[a] EBC export turbine plus the EAX export turbine, both equipped with SCR.

[b] Results derived from AERMOD modeling.

[c] Benchmark level below which a source is not considered to contribute a significant impact on air quality in this analysis.

[d] For analysis of the alternative technologies alternative.

[e] NA = not applicable.

humidities are high. These conditions do not entirely translate across to the hotter desert-like climate of the Imperial Valley-Mexicali region. Where these conditions do not apply, under high temperatures and low relative humidities, such a production term would be much lower (i.e., <<0.6 g NH_4NO_3 per 1.0 g of NO_x).

Nevertheless, DOE and BLM used the San Joaquin-derived production term to estimate the formation of NH_4NO_3 from NO_x emissions for the proposed action (the operation of the TDM facility, and EBC and EAX-export units at the LRPC), as well as for other operational scenarios for the Mexico power plants. The San Joaquin NH_4NO_3 production term was recognized to represent a highly conservative overestimate. Estimates of NH_4NO_3 PM_{10} that could be formed were made based on the plant NO_x emissions from the power plants that could produce HNO_3, which would then react with available ambient NH_3 to form NH_4NO_3. NH_3 would be available from all regional sources and not just the small amount emitted from the power plants. (That is, in Imperial County, which is an ammonia-rich area [see the text box on page 4-48], it is the NO_x emissions and not the NH_3 emissions from the power plants that would determine how much NH_4NO_3 could form.)

TABLE 4.3-5 Criteria Pollutant Increases at a Maximum Receptor Point in the United States Resulting from the Three EAX Turbines — No Action Alternative[a]

Criteria Pollutant	Averaging Period	Concentration at Maximum United States Receptor[b] ($\mu g/m^3$)	Significant Impact Level (SL)[c] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO (LRPC turbines without CO oxidizer)	8-hour	5.63	500	40,000
CO (turbines with CO oxidizer)[d]	8-hour	0.70	500	40,000
PM_{10}	24-hour	2.58	5	150
PM_{10}	Annual	0.100	1.0	50
Through March 2005				
SCR on EAX export turbine, no SCR on two EAX Mexico turbines				
NO_2	1-hour	27.8	NA[e]	NA
NO_2	Annual	0.25	1.0	100
NH_3	1-hour	1.03	NA	NA
NH_3	Annual	0.009	NA	NA
March 2005 Onward				
SCR on all three EAX turbines				
NO_2	1-hour	3.98	NA[e]	NA
NO_2	Annual	0.036	1.0	100
NH_3	1-hour	3.09	NA	NA
NH_3	Annual	0.028	NA	NA

[a] The three EAX turbines operating.

[b] Results derived from AERMOD modeling.

[c] Benchmark level below which a source is not considered to contribute a significant impact on air quality in this analysis.

[d] For analysis of the alternative technologies alternative.

[e] NA = not applicable.

Next AERMOD was used to estimate the maximum concentration of NH_4NO_3 at a receptor point in the United States of the amounts of NH_4NO_3 that had been estimated to form at the power plants in Mexico. Results for the proposed action indicated low concentration levels, less than 1 $\mu g/m^3$ NH_4NO_3 24-hour PM_{10} and 0.03 $\mu g/m^3$ NH_4NO_3 annual PM_{10}. These estimates were based on the conservative assumption that the San Joaquin-derived production factor is equally applicable to the Imperial Valley-Mexicali region, and thus were regarded as substantial overestimates.

TABLE 4.3-6 Criteria Pollutant Increases at a Maximum Receptor Point in the United States from the TDM and All Four LRPC Units[a]

Criteria Pollutant	Averaging Period	Concentration at Maximum United States Receptor[b] ($\mu g/m^3$)	Significant Impact Level (SL)[c] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO (LRPC turbines without CO oxidizer)	8-hour	7.67	500	40,000
CO (turbines with CO oxidizer)[d]	8-hour	1.09	500	40,000
PM_{10}	24-hour	4.07	5	150
PM_{10}	Annual	0.17	1.0	50
Through March 2005				
At LRPC, SCR on export EBC and EAX, no SCR on two Mexico EAXs				
NO_2	1-hour	30.3	NA[e]	NA
NO_2	Annual	0.293	1.0	100
NH_3	1-hour	4.05	NA	NA
NH_3	Annual	0.061	NA	NA
March 2005 Onward				
At LRPC, SCR added on the two Mexico EAXs				
NO_2	1-hour	6.41	NA	NA
NO_2	Annual	0.0781	1.0	100
NH_3	1-hour	5.51	100	NA
NH_3	Annual	0.080	100	NA

[a] EBC export, EAX export, and two EAX Mexico turbines at the LRPC.

[b] Results derived from AERMOD modeling.

[c] Benchmark level below which a source is not considered to contribute a significant impact on air quality in this analysis.

[d] For analysis of the alternative technologies alternative.

[e] NA = not applicable.

In a study of PM_{10} in the Imperial Valley-Mexicali area, Chow and Watson (1995) concluded that secondary NH_4NO_3 contributions (from all sources) to regional PM_{10} are low, in the range of 2 to 3 $\mu g/m^3$ for 24-hour measurements. These data, which encompass all regional sources of NH_4NO_3, provide strong corroborating evidence that the modeling of around 1 $\mu g/m^3$ 24-hour concentration levels using a San Joaquin-based production term applied to a single NO_x source (approximately 500 tons [454 t] per year in a regional background of tens of thousands of tons per year) represents a gross overestimate.

In conclusion, the above analysis indicates that secondary formation of NH_4NO_3 as a result of NO_x (and any NH_3) emissions from the TDM and LRPC power plants would be de minimis, and thus little associated impact can be ascribed.

Ozone formation. The potential influence of the TDM and LRPC plants on O_3 levels in the region that may result from their emissions was investigated. NO_x is one of the primary precursors in O_3 formation, along with VOC in the form of reactive organic gases. Both of these precursors are emitted from the power plants and are already present in the ambient atmosphere from numerous other sources. NO_x, VOC, and other precursors emitted to the atmosphere can participate in photochemical reactions that produce the secondary pollutant O_3.

Ozone modeling. The EPA's OZIPR model was used to estimate possible incremental O_3 formation. The model requires the initial ambient concentrations and hourly emission rates for the power plants and for the region for NO_x, VOC, and CO. It also requires VOC speciation (relative amounts of major constituents) and meteorological conditions for "typical" days.

Ambient concentrations of NO_x and CO were available from Imperial County. VOC ambient concentrations were not available for the Imperial County-Mexicali area. Thus, surrogate values from the Phoenix, Arizona, area were selected for OZIPR model runs as the best available.[3] Emissions inventory data for VOC, NO_x, and CO were available and were drawn upon for the combined Imperial County (ARB 2004a) and Mexicali area (ERG et al. 2003). Plant emission rates for VOC, NO_x, and CO were taken from Table G-1. In addition, VOC speciation profiles and "typical" meteorological conditions determined through a cluster analysis as required in the model were taken from Phoenix as included in the model database (EPA 1999c).

Initial model conditions were estimated based on an average of 7 a.m. to 9 a.m. actual measured concentration values. Estimates of O_3 formation were modeled from 8 a.m. to 8 p.m., the time frame during which

Ammonia-Rich Area

The Imperial Valley is an inland valley under intensive agricultural production stimulated by large-scale irrigation. Agriculture that includes crop production, cattle, cattle feedlots, and sheep rearing forms an important component of the border area economy. NH_3 emissions are dominated by agricultural and livestock sources. Feedlots in the Mexicali area and Imperial Valley are a major NH_3 source. NH_3 emissions from livestock arise mainly from the decomposition of urea in animal wastes, and ammonia output reflects the nitrogen input from feed. Other regional agricultural sources are emissions from fertilizers, crops, and the decomposition of agricultural vegetation. The EPA Tier Emission Report from the National Emission Inventory Database for Criteria and Hazardous Air Pollutants (EPA 2004a) lists the 1999 emissions of NH_3 as 12,310 tons/yr (11,167 t/yr) in Imperial County. Area emissions of NH_3 for the state of Baja California, including agriculture, are listed as more than 9,000 tons/yr (8,165 t/yr) (which may be an underestimate). In summary, this Imperial Valley/Mexicali region can be regarded as an NH_3-rich area. NH_3 emissions from the power plants (maximum 646 tons/yr [586 t/yr]) are small compared with existing regional emissions.

[3] Phoenix, Arizona, is one of the 10 cities that was already built into the OZIPR database (EPA 1999c) and is the most representative proximate city in terms of climate, latitude, and physiography. Phoenix is approximately 210 mi (338 km) east-northeast of the Imperial Valley/Mexicali area. It lies in the central part of the Salt River Valley, a broad, oval-shaped, nearly flat plain. Like the Imperial Valley/Mexicali area it has a desert climate with low annual rainfall and low relative humidity. Daytime temperatures are high throughout the summer months. As the physiographic and climatic descriptions of the Imperial Valley/Mexicali area in Sections 3.1.2 and 3.3.1 indicate, the Phoenix area is broadly similar. Phoenix has a population of approximately 1.3 million compared with the Imperial Valley/Mexicali area of approximately 0.9 million and, like Mexicali, is urban.

Ozone Formation

Fossil-fueled power plants emit primarily NO_x, CO, and PM_{10}. Nitric oxide, NO, and a small amount of NO_2 are initially produced in the turbine combustion zones. NO vented into the atmosphere undergoes subsequent oxidation to NO_2. These two compounds also interchange in the atmosphere. Ozone, O_3, is a secondary pollutant formed in the presence of sunlight from a variety of precursors that include NO_x (where $NO_x = NO + NO_2$), VOC, and CO. The chemical processes in O_3 formation are favored by sunshine and stagnant air. A simple synopsis of O_3 formation involves breaking down NO_2 by ultraviolet radiation to NO and O (where O is an oxygen atom), followed by O reacting with an oxygen molecule to form O_3. However, the entire process is more complex and can be nonlinear (i.e., output is not necessarily proportional to input). A series of tropospheric photochemical reactions involving reactive OH and HO_2 radicals play a role in producing O_3, along with oxygenated products such as nitric acid, peroxy acetyl nitrate, aldehydes, and organic acids. Nitrogen dioxide can also be regenerated by these series of reactions. Particulates and short-lived radicals form as well. VOC could be regarded as a "fuel" for O_3 formation in urban-like environments where there is plenty of available NO_2. In addition, CO that originates from incomplete combustion in fossil fuels or that is formed from the oxidation of methane in the atmosphere can produce O_3 in an NO-rich environment, but can also remove O_3 in an NO-depleted environment. Freshly emitted NO can scavenge O_3, producing NO_2. High NO_2 levels can form other products, such as HNO_3, that block the initial oxidation step for VOC and thus prevent the net formation of O_3. Sometimes a decrease in NO_x emissions may even lead to an increase in O_3. Ozone formation in urban-like environments tends to be VOC-limited (i.e., adding VOC may increase O_3, whereas adding NO_x may not, and may in fact decrease O_3). As air masses move away from industrial urban centers, the VOC/NO_x ratio tends to become higher, and at the high VOC/NO_x ratios typical of more rural settings, O_3 formation tends to be NO_x-limited (i.e., adding NO_x may increase O_3 levels, whereas adding VOC may not).

peak O_3 concentrations occur, typically mid-afternoon. Because uncertainties could be associated with the use of default parameters, model runs were made in which these default parameters were varied. The results of this sensitivity analysis are presented in Appendix G and are discussed further below.

OZIPR was used to predict peak O_3 concentrations[4] for the following scenarios:

1. Baseline regional conditions, that is, assuming no power plants existed or operated.

2. The less than 1-year period before March 2004 when 3 SCRs were operating at the Mexico power plants (on each of the two TDM turbines and on the LRPC EBC turbine).

3. The time period March 2004 through March 2005: two turbines at TDM each operate with an SCR installed for NO_x control, an EBC turbine with an SCR installed operates at LRPC, an EAX export turbine with an SCR installed operates at the LRPC, and the two Mexico EAX turbines at the LRPC operate with no SCRs installed. This corresponds to four SCRs operating at all the Mexico power plants.

[4] The maximum modeled hourly value for the modeled period, 8 a.m. to 8 p.m.

4. The period from March 2005 onward: two turbines at TDM each operate with an SCR installed, an EBC turbine at the LRPC operates with an SCR installed, an EAX export turbine at the LRPC operates with an SCR installed, and two additional SCRs installed on the Mexico-dedicated EAX units at the LRPC operate. This corresponds to six SCRs operating at the Mexico power plants.

OZIPR model results are presented in Table 4.3-7 and Figure 4.3-1 and indicate that NO_x and VOC emissions from all the Mexico power plants would produce at most marginal increases in peak O_3 concentrations.

The two EAX turbines for Mexico at the LRPC would operate contemporaneously with the proposed action. Unlike in the analysis of criteria pollutants using the AERMOD model presented earlier, the emissions from these turbines are included in the analysis of all plant configurations in the current analysis, even though they are not included in the proposed action as defined above. These turbines are included so that the impacts of the sequential addition of SCRs on all three EAX turbines can be compared in the same analysis. While, with this configuration, it is not possible to compare alternatives in the same way as was done for the criteria pollutants, such results can be inferred from the trends exhibited in the current results. In any case, O_3 impacts are very small for all configurations analyzed, as discussed below:

TABLE 4.3-7 OZIPR Modeled Changes in O_3 Concentrations as a Result of Power Plant Operations

Power Plant Configurations	Peak Modeled O_3 Concentration	Change in O_3 Concentration as a Result of Power Plant Operations
Baseline:		
No power plants operating	0.1373 ppm, 269.4 µg/m^3	NA[a]
July 2003 – January 2004 (3 SCRs)		
TDM+EBC export with SCRs Plus: Three EAXs with no SCRs	0.1373 ppm 269.4 µg/m^3	0.0 ppm 0.0 µg/m^3
March 2004 –March 2005 (4 SCRs)		
TDM+EBC+EAX export with SCRs Plus: Two Mexico EAXs with no SCRs	0.1379 ppm, 270.6 µg/m^3	+ 0.0006 ppm + 1.2 µg/m^3
March 2005 Onward (6 SCRs)		
TDM+EBC+EAX export with SCRs Plus: Two Mexico EAXs with SCRs	0.1381 ppm 271.0 µg/m^3	+ 0.0008 ppm + 1.6 µg/m^3

[a] NA = not applicable.

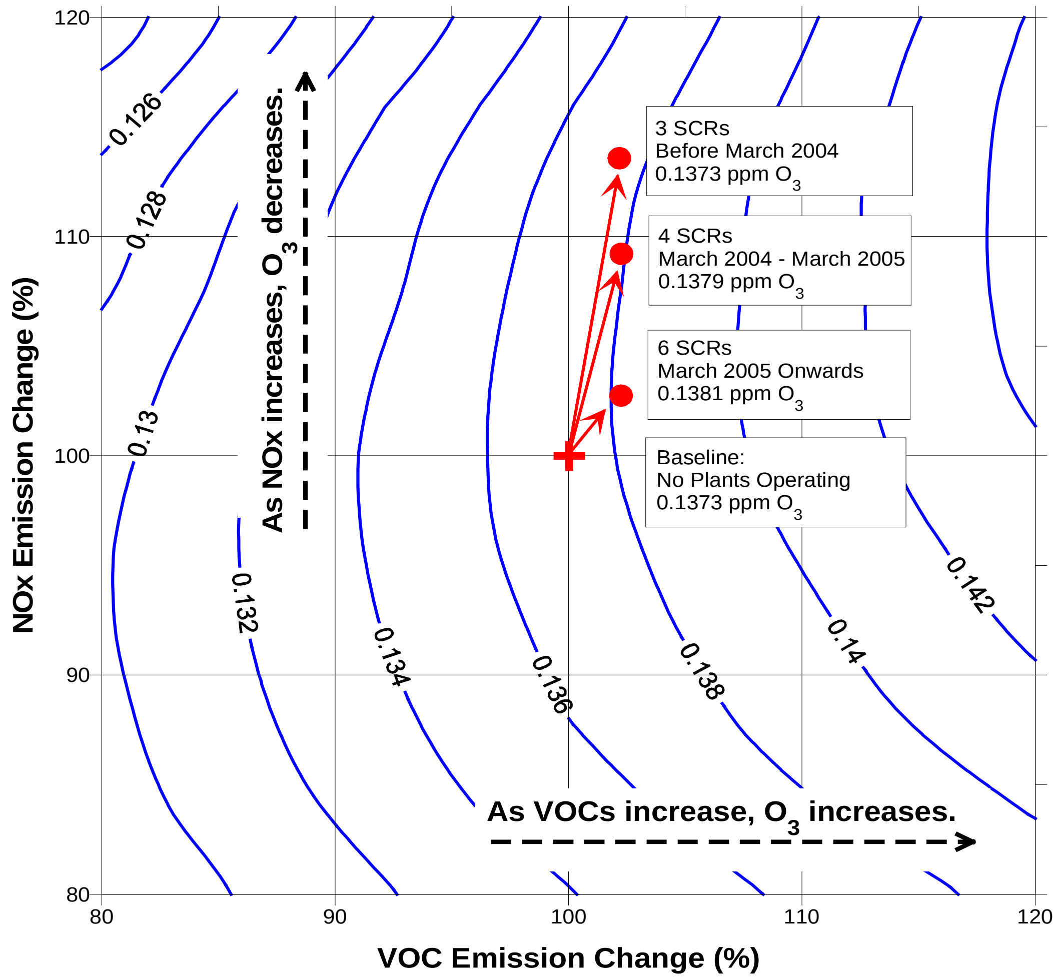

FIGURE 4.3-1 Relationships among NO_x, VOC, and O_3 in Modeled Changes in Peak O_3 Concentration (contour lines [isopleths] denote peak O_3 concentrations in ppm)

No power plants operating: For the baseline regional conditions that represent no power plants operating, OZIPR estimates a peak O_3 level of 0.1373 ppm.

Three SCRs operating: Overall NO_x emissions from the plants would be highest due to the absence of SCR on the EAX turbines. Modeling indicates, however, that O_3 levels would not change from regional baseline conditions as shown in Figure 4.3-1.

Four SCRs operating: The period March 2004 to March 2005 represents a time frame in which a total of four SCRs are operating at the Mexico power plants. As shown in Table 4.3-7 and Figure 4.3-1, O_3 peak levels were estimated to increase by 0.0006 ppm (1.2 μg/m^3), or 0.4%.

Six SCRs operating: The period March 2005 onward represents a time frame in which a total of six SCRs would operate at the Mexico power plants, and when two additional SCRs would be installed on the Mexico-dedicated EAX units to further reduce NO_X emissions, albeit their operation is outside of the proposed action. As Table 4.3-7 and Figure 4.3-1 indicate, a small increase in peak O_3 levels was estimated, namely 0.0008 ppm (1.6 µg/m^3), or 0.6%. That is, in this case adding more SCRs for NO_X control decreases NO_X emissions, but has the effect of slightly increasing modeled peak O_3 concentrations.

Figure 4.3-1 represents an OZIPR simulation based on annual total emissions and typical meteorological conditions. Details including regional emission data and the sensitivity results can be found in Appendix G in Tables G-4 and G-5. As Figure 4.3-1 shows, as NO_X increases above baseline levels, O_3 levels decrease; and as VOC increases, O_3 increases. This behavior explains the above results where an increase in NO_X emissions (three SCR case) does not contribute to an increase in modeled O_3. This result is consistent with an area that behaves as an urban-like region where O_3 tends to be VOC-limited, not NO_X-limited (VOC/NO_X ratios are in the VOC-limited region).

In general, O_3-NO_X-VOC modeling for individual locations and episodes has a relatively high uncertainty, driven by complex nonlinear photochemistry, temporal and spatial patterns of precursor emissions, and meteorological conditions. Generalizations about NO_X- versus VOC-limited conditions reflect average regional conditions. That is, these conditions can vary from episode to episode at one location and even during the evolution of the episode. In this context, the modeled area appears to behave on average like a VOC-limited urban-like area.

The parameters that were varied in the sensitivity analysis (Appendix G) included initial ambient concentrations (increased and decreased by a factor of two), regional emissions (increased and decreased by a factor of two), meteorological conditions (temperature from 100 to 111°F [38 to 44°C], a morning mixing height of 925 to 7,238 ft [282 to 2,206 m]) and an afternoon mixing height of 11,280 to 18,960 ft (3,438 to 5,779 m), and VOC speciation (using Los Angeles and Houston data). Results were obtained for this range of input for power plants equipped with SCRs on three, four, and six of the six turbines at both plants. The 3-SCR case represents SCRs on the two TDM turbines and on the EBC turbine at the LRPC as configured for a portion of 2003. The 4-SCR case represents the current configuration with the SCR added to the EAX export turbine. The 6-SCR case represents the period after March 2005 when SCRs will be added to the two Mexico EAX turbines.

The results of the sensitivity analysis (Table G-5) indicated that power plant emissions could result in either increases or decreases in peak O_3 concentrations for the 3-SCR and 4-SCR cases, depending on model input assumptions. Increases in O_3 as a result of plant emissions would occur when model inputs give rise to NO_X-limited conditions, while decreases would occur when input leads to VOC-limited conditions. Both the maximum predicted O_3 increase of 0.0036 ppm and maximum O_3 decrease of 0.0155 ppm occurred under the 3-SCR case when NO_X emissions from the power plants would be the greatest. Results for the 4-SCR case ranged from an increase of 0.0026 ppm to a decrease of 0.0086 ppm.

Under the 6-SCR case, however, only very small increases, ranging from 0 to 0.001 ppm, are predicted over the entire range of input conditions modeled. These results indicate that, even under NO_x-limited conditions, emissions from the power plants would not cause significant increases in maximum O_3 concentrations.

In conclusion, OZIPR modeling of O_3 formation in the Imperial Valley-Mexicali area does not indicate any meaningful change in O_3 levels as a result of the operation of the TDM or LRPC power plants.

Impacts compared to EPA significant impact levels. The estimated levels of NO_2, CO, and PM_{10} shown in Tables 4.3-2 through 4.3-6 are compared to NAAQS and EPA SLs established for these criteria pollutants. The regulatory jurisdiction of the EPA does not pertain to air pollutant emissions in Mexico; nevertheless, a useful benchmark is found within EPA air permitting regulations, and permitting guidance can be drawn upon to help assess the significance of these predicted increases from Mexico sources at the United States border and points north. In the context of permitting a major source or major modification in the United States, the EPA has established SLs for the criteria pollutants NO_2, SO_2, CO, and PM_{10}, below which a major source or modification will not be considered to cause or contribute to a violation of NAAQS for which no additional air quality analysis is required [40 CFR 51.165(b)(2) and 40 CFR 51, Subpart W, Appendix S, III.A]. Where air dispersion modeling is performed, the EPA does not require a full impact analysis when pollutant emissions from a proposed source or modification would not increase ambient concentrations by more than the prescribed SLs. Thus, SLs may be generally regarded as thresholds below which impact is not viewed to be significant. Conversely, emissions exceeding a SL would only require that a full impact analysis be performed. However, it should be emphasized that although these SLs have regulatory provenance as de minimis values in the context of regulating U.S. sources, they are referenced here (in the context of the impact of a Mexico source to a U.S. receptor) merely for purposes of NEPA review to act as benchmarks or yardsticks to help the decision maker or the reader assess how significant any actual level of an air pollutant might be in terms of any potential impact. These levels do not represent a “must pass” litmus test.

As shown in Table 4.3-4 for the proposed action, the maximum increase in ambient concentrations of air pollutants in Imperial County associated with emissions from the export turbines are below SLs established by the EPA. Likewise, as shown in Tables 4.3-2, 4.3-3, and 4.3-6, the same finding holds true; that is, maximum increases in ambient concentrations of criteria air pollutants in Imperial County remain below SLs for the TDM plant alone, the LRPC export units alone, and all turbines from both plants, respectively. For the no action alternative, Table 4.3.5 shows increases in ambient concentrations of criteria air pollutants in Imperial County, which are also below SLs. Thus, in reference to these benchmark SLs, the combined impacts on air quality from the generating facilities in Mexico exporting power to the United States would be minimal.

This finding that the impact levels at the U.S. receptor points would be small and below SLs is consistent with the influence of general regional surface winds. As illustrated in the wind

Regulatory Citations to "Significance Levels"

40 CFR 51.165(b)(2) states:
"A major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the following ***significance levels*** *at any locality that does not or would not meet the applicable national standard."* (Significance levels shown in a table that follows.)

40 CFR 51, Subpart W — Determining Conformity of General Federal Actions to State or Federal Implementation Plans, Appendix S to Part 51 — Emission Offset Interpretative Ruling III.A states:
"This section applies only to major sources or major modifications which would locate in an area designated in 40 CFR 81.300 et seq. as attainment or unclassifiable in a State where EPA has not yet approved the State preconstruction review program required by 40 CFR 51.165(b), if the source or modification would exceed the following ***significance levels*** *at any locality that does not meet the NAAQS.* (Significance levels shown in a table that follows.)

EPA's *New Source Review Workshop Manual: Prevention and Significant Deterioration and Nonattainment Area Permitting,* Draft, October 1990 (only issued as a draft), Chapter C, The Air Quality Analysis, Section IV, "Dispersion Analysis," in determining the impact area where air dispersion modeling needs to be carried out in the analysis of Prevention of Significant Deterioration (PSD) increments, states:
"The proposed project's impact area is the geographical area for which the required air quality analyses for the NAAQS and PSD increments are carried out. This area includes all locations where the significant increase in the potential emissions of a pollutant from a new source, or significant net emissions increase from a modification, will cause a significant ambient impact (i.e., equal or exceed the applicable ***significant*** *ambient impact* ***level****, as shown in* [table of significant impact levels]. *The highest modeled pollutant concentration for each averaging time is used to determine whether the source will have a significant ambient impact for that pollutant."*

rose figures (Figures 3.3.2 through 3.3.11 in Section 3.3.1), for much of the year, the winds that transport air pollutants and other species mainly blow from the United States into Mexico; that is, Mexico would be generally more influenced by airborne U.S. sources than the United States would be influenced by airborne Mexico sources. Nevertheless, Mexicali, as a major city, represents a higher source term for air pollutants than Imperial County. In the hot summer months of June, July, and August, surface winds from Mexico into the United States tend to dominate.

4.3.4.4.3 Global Climate Change and Carbon Dioxide Emissions. Change in global climate or global warming as a consequence of ever-increasing concentrations of "greenhouse gases" in the Earth's atmosphere is regarded to be a worldwide environmental issue. Climate change and its possible acceleration have become the subject of much scientific and political debate in regard to a relationship between increased global temperatures and the increasing concentrations of greenhouse gases, and CO_2 emissions in particular, brought about by human activities. Incoming radiation from the Sun reaches the Earth's atmosphere as short wavelength radiation (ultraviolet), intermediate wavelength radiation (visible light), and longer wavelength radiation (infrared). About 90% is intermediate wavelength (visible light or near infrared), and less than 10% is shorter wavelength (ultraviolet). The Earth's atmosphere allows most of this radiation to penetrate to the surface and warm it. This heat is radiated back up into the atmosphere as longer wavelength infrared radiation. Greenhouse gases in the atmosphere can absorb some of this outgoing infrared energy, retaining heat. This is popularly known as the "greenhouse effect," the analogy being the trapping of heat by the glass panels of a greenhouse.

(This term is somewhat of a misnomer because the main effect of the glass in a greenhouse is to retain the warm air inside and not let it escape, whereas the Earth's atmosphere does not act as such a physical barrier.)

The primary greenhouse gases are water vapor, CO_2, methane, nitrous oxide, O_3, and other species such as halocarbons, perfluorocarbons, and sulfur hexafluoride. Although these greenhouse gases only form a small percentage of the atmosphere, their collective effect is to keep the average temperature of the Earth's surface about 60°F (16°C) warmer than it would otherwise be, making life as we know it today possible. Water vapor is the most abundant greenhouse gas in the atmosphere and is natural in origin. The second most abundant greenhouse gas is CO_2, which is both natural and anthropogenic. However, CO_2 concentrations in the atmosphere have continuously increased at an ever-rising rate from approximately 280 parts per million by volume (ppmv) in preindustrial times to 373 ppmv in 2002, a 33% increase, and most of this increase has occurred in the last 100 years. The primary cause of such a rise has been recognized to be the ever-increasing rate of CO_2 emissions from fossil fuel burning by man.

Carbon dioxide emissions. Since there is no Federal regulatory guidance on CO_2 emissions, an analysis was conducted that focused on a comparison between global and U.S. emissions and the total emissions from the no action and proposed action alternatives. That comparison is shown in Table 4.3-8, as well as comparisons for the two TDM turbines that exclusively export power to the United States, the two turbines at the LRPC that export power to the United States, and all of the power plants in Mexico (i.e., TDM plus LRPC). Because CO_2 is stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, climatic impact does not depend on the geographic location of sources. Therefore,

TABLE 4.3-8 Comparison of Annual CO_2 Emissions from the TDM Plant and LRPC Turbines to 2001 United States and Global Emissions

	Maximum Tons per Year of CO_2	Percentage of CO_2 Emissions from United States Fossil Fuel Combustion[a]	Percentage of CO_2 Emissions from Global Fossil Fuel Combustion[b]
No action: three LRPC EAX turbines	3,889,500	0.066	0.017
Proposed action: TDM plus LRPC export turbines	5,186,000	0.088	0.023
TDM turbines	2,528,000	0.043	0.011
LRPC export turbines	2,593,000	0.044	0.012
LRPC Mexico turbines	2,593,000	0.044	0.012
TDM plus LRPC export and Mexico turbines	7,714,000	0.13	0.035

[a] U.S. CO_2 emissions in 2001 from fossil fuel are estimated to be 1.57 billion metric tons of carbon equivalent (MMTCE), or 5.87 billion tons (5.3 billion metric tons) of CO_2 (EIA 2001).

[b] Global CO_2 emissions in 2001 from fossil fuel are estimated to be 6,567.62 MMTCE or 24.63 billion tons (22.3 billion metric tons) of CO_2 (EIA 2001).

an increase of CO_2 emissions at a specific source effectively alters CO_2 concentrations only to the extent that it contributes to the global total of fossil fuel burning that increases global CO_2 concentrations.

As Table 4.3-8 indicates, the percentage increase in CO_2 emissions contributed by the TDM plant and the two LRPC export turbines under the proposed action is approximately 0.088% compared with total U.S. emissions from fossil fuel combustion and 0.023% compared with global emissions. The percentage increase in CO_2 emissions contributed by the three LRPC EAX turbines used under the no action alternative is 0.017% compared with global emissions and 0.066% compared with U.S. emissions. The expected impacts to global climate change would be negligible. Comparative estimates are based on maximum CO_2 emissions from the respective turbines; actual operational emissions would be lower.

The gas-fired combined-cycle systems used at the TDM and LRPC plants use state-of-the-art General Electric Model 7FA and Siemens-Westinghouse 501 F gas-fired turbines, respectively, and result in a current thermal efficiency of just under 60%, much higher than conventional power plants. This efficiency and associated low CO_2 emissions are well suited for global climate change initiatives addressing energy needs. The mitigating displacement of less efficient generation that otherwise results in higher CO_2 emissions and the economic efficiencies of these projects all resonate with international commitments and with current U.S.-stated goals in helping address the balance between environmental concern and economic needs.

4.3.4.4.4 PM Emissions from Exposed Salton Sea Lakebed. As discussed in Section 4.2, annual inflow to the Salton Sea from the New River would be reduced by a maximum of approximately 10,000 ac-ft/yr (0.39 m^3/s) because of reduced water flow in the New River arising from consumptive water losses by the TDM and LRPC power plants in Mexico. The reduced inflows would cause the volume of the Salton Sea to decrease and thus the surface area of the sea to shrink. Once the volume of the sea stabilizes in response to the reduced inflows, the surface area of the sea is estimated to shrink by approximately 97 acres (39 ha) or 0.041%. This figure is based on reduced inflows attributable to the operation of TDM and the entire LRPC at 100% capacity factor, and thus overstates the impact from the proposed action. The reduced inflows attributable to the operation of TDM, EBC, and the EAX export turbine are estimated to result in a reduction in the surface area of the Salton Sea of 65 acres (26 ha), or 0.028%. DOE and BLM conducted an investigation into the possible increase in fugitive emissions of PM_{10} by wind erosion of the Salton Sea lakebed that would be exposed as a result of the reduction in the volume of water in the sea.

In 2002, the EIR/EIS for the IID Water Conservation and Transfer Project was published (IID 2002). The proposed action would transfer up to 300,000 ac-ft/yr (11.73 m^3/s) of IID's Colorado River entitlements to water districts in southern California for urban use. Implementation would change the amount of drainage that would otherwise flow into the Salton Sea. The EIR/EIS predicts that by 2007, 15,100 acres (6,110 ha) of lakebed could be exposed and the surface level lowered by about 3 ft (1 m). The IID concluded that a reasonable quantitative estimate of PM_{10} emissions from exposed lakebed could not be made because of lack of data regarding sediment emissive characteristics, surface stability, spatial variations in sediment characteristics and soil erodibility, temporal variation in wind conditions, and variation in factors contributing to the formation of salt crusts and otherwise influencing the tendency of lakebed surfaces to emit PM_{10} in high winds. However, the EIR/EIS contains a qualitative comparison between the Salton Sea and Owens Lake with respect to the driving factors for PM_{10} emissions (primarily wind and sand conditions).

Owens Lake and the Salton Sea

Owens Lake, located in Inyo County, California, in many ways is analogous to the Salton Sea. It was once an alkali (brine) lake about 110 mi^2 (285 km^2) in area and up to 30 ft (9 m) deep located at the terminus of the Owens River. The Salton Sea is a brine lake about 360 mi^2 (285 km^2) in area and up to 50 ft (15 m) deep. Owens Lake supported two steamship lines in the late 1800s. It dried up virtually completely in the late 1920s due to water diversion into the Los Angeles Aqueduct. Because of the exposed salt and alkali flats, frequent dust storms are a major concern. Owens Lake is recognized to be the highest single PM_{10} area source in the United States.

As the EIS/EIR describes, high winds at the Salton Sea are much less frequent than those at Owens Lake. Above a threshold velocity, surface sands "saltate" (skip along the surface) and with each impact may break coherent soil crust and eject PM_{10}. The correlation of sand motion with PM_{10} is so pronounced that sand motion is one of the primary tools for mapping PM_{10} emissions at Owens Lake. There is an almost continuous ring of sand dunes around the Owens Lake shoreline, as well as extensive areas of shifting sheets of sand on the lakebed, and extensive areas of deep sand deposits. In contrast, as the EIS/EIR describes, there is very little sand to blow and create PM_{10} emissions in the southeastern shore areas of the Salton Sea, where bathymetry suggests that the lakebed would be most extensively exposed. There are no sand dunes in this area as potential sand sources, and for those that do exist on the western shore, bathymetry suggests that the area of lakebed exposed in this area would be very limited. In addition, salt chemistry at Owens Lake is dissimilar to that at the Salton Sea and these differences favor increased emissions from Owens Lake. As the EIS/EIR describes, year-old crusts are generally damaged in the emissive areas at Owens Lake, whereas relatively older crusts (> 18 months) generally show little damage at the Salton Sea. Moreover, unlike Owens Lake, which is almost entirely dry, most of the Salton Sea lakebed that would be exposed because of the reduced flows would remain subject to periodic inundation due to seasonal and year-to-year variations in the level of the sea. This phenomenon further reduces the emissive potential of the exposed Salton Sea lakebed relative to Owens Lake. The EIR/EIS ultimately concludes that the conditions that promote PM_{10} emissions at Owens Lake appear to be largely absent in the Salton Sea, indicating that the rate of emissions from exposed Salton Sea lakebed would be significantly lower than from Owens Lake.

Notwithstanding these limitations and major qualifications in using Owens Lake emission data as a model, DOE and BLM extrapolated from measurements of fugitive dust emissions from Owens Lake (Gillette et al. 2004) to calculate an upper bound estimate of emissions from the Salton Sea lakebed before any adjustment to account for differences in emissive conditions between the areas in question. Gillette et al. (2004) carried out a long-term measurement program and by using a combined modeling and measurement technique derived that 72,000 tons/yr (65,000 t/yr) of PM_{10} were generated from Owens Lake for a 12-month period between July 1, 2000, and June 30, 2001. DOE and BLM indexed this value to the total Owens

Lake lakebed area of 70,400 acres (28,490 ha) and proportioned it to the maximum 97-acre (39-ha) exposure of Salton Sea lakebed and to the 65 acres (26 ha) that would be attributable to the proposed action, to yield values of 99 tons/yr (90 t/yr) of fugitive PM_{10} emissions attributable to the operation of TDM and the entire LRPC, and 65 tons/yr (59 t/yr) of fugitive PM_{10} emissions attributable to the proposed action.

Given the lower emissive conditions at the Salton Sea compared with Owens Lake, the actual PM_{10} emissions from the Salton Sea lakebed that would be expected to result from the proposed action would be far lower than this 65-ton (59-t/yr) figure. The Salton Sea Authority has suggested that emissions from the sea lakebed may be on the order of only 1% of the emissions from Owens Lake (Kirk 2004). Likewise, Gillette et al. (2004) stated that the application of mitigation measures at Owens Lake, such as shallow flooding, managed vegetation, or gravel on identified dust source areas (measures that would make these areas more comparable to conditions at the Salton Sea) would be expected to reduce dust emissions by 99% (to 1%). Applying a 1% factor to the 65-ton/yr (59-t/yr) figure extrapolated from the Owens Lake data would yield an emission rate of less than 1 ton/yr (1 t/yr). If, however, a 10% factor was applied that was additionally conservative by being ten times greater, the estimated rate would be less than 10 tons/yr (9 t/yr). Given the significant differences in emissive conditions between Owens Lake and the Salton Sea, these estimated rates are likely to realistically bracket any actual emissions from any exposed Salton Sea lakebed attributable to the proposed action.

4.3.5 Alternative Technologies

Under the alternative technologies alternative, DOE and BLM would grant one or both permits and corresponding ROW grants to authorize transmission lines that connect to power plants that would employ more efficient emissions controls and/or an alternative cooling technology.

4.3.5.1 More Efficient Emissions Controls

Under the proposed action, the TDM plant would use SCR and oxidizing catalysts to reduce CO emissions. The LRPC plant also would incorporate SCR systems on all turbines by March 2005; however, it would not utilize CO emissions controls. This alternative analyzes the environmental impacts if oxidizing catalysts were utilized on all turbines, including those at the LRPC.

Additional CO emissions control technologies were analyzed for the LRPC plant equipped with CO oxidizers on four turbines. Table 4.3-4 gives estimated maximum air concentrations at receptor locations in Imperial County for this emission control technology for comparison to the proposed action. Table 4.3-6 gives estimated concentrations for this technology for comparison with the cumulative impacts of the LRPC and TDM plants from CO emissions as equipped under the proposed action; that is, no oxidizers on LRPC turbines, and oxidizers on TDM turbines.

As Table 4.3-4 indicates, the increase in ambient CO concentrations in Imperial County associated with emissions from export turbines equipped with CO oxidizers would be slightly lower than in the proposed action. All values, including those for the proposed action, are well below SLs established by the EPA.

4.3.5.2 Alternative Cooling Technology

Environmental impacts from an alternative cooling technology are primarily of concern in the area of impacts to water resources. However, there are also some considerations for air quality. The dry cooling phase of a wet-dry system tends to result in somewhat reduced plant efficiency, on the order of 10 to 15%, especially when outdoor temperatures exceed 90°F (32°C). This reduced plant efficiency could mean that for a given amount of fuel input, less electricity could be produced. This reduction in electrical output would need to be replaced by other power plants that would burn additional fuel and produce additional emissions (DOE, NREL, and ANL 2002).

Table 4.3-4 gives the estimated increase in ambient air concentrations of PM_{10} in Imperial County produced by stack and cooling tower emissions from all export units under the proposed action. Maximum concentrations are below SLs in all cases. These levels would be reduced further for power plants employing a wet-dry cooling system.

4.3.6 Mitigation Measures

The mitigation measures addressed under this alternative pertain mainly to offsets of air emissions from the power plants. The Notice of Intent (NOI) (68 FR 61796) gave two examples of mitigation measures that could be considered to offset emissions from the power plants: paving of roads and retirement of older automobiles, which typically have high emissions, from use in the Calexico-Mexicali area. DOE contacted the ICAPCD and Border Power to obtain suggestions for off-site mitigation measures that could be evaluated under this alternative (Russell 2004; Poiriez 2004a,b,c; Pentecost and Picel 2004; Powers 2004a).

These and other mitigation measures can be evaluated on a per-unit, or individual, project basis. For example, reductions in PM_{10} and NO_x emissions that could occur as a result of paving roads, updating engines in agricultural and transportation equipment, and using more efficient, newer automobiles could be assembled into a program that would offset emissions from the power plants. The following evaluates possible elements of such programs but does not specify combinations of elements.

4.3.6.1 Mitigation Measures in Imperial County

The following mitigation measures identified by the ICAPCD are considered under this alternative. Implementation of one or more of these measures would serve to improve air quality in Imperial County.

Paving of Roads: An effective and viable mitigation program would be a road repaving program similar to others that have been carried out in California, Texas, and elsewhere in Mexico. The concept is fairly simple although application would be case-specific. PM_{10} fugitive emissions from unpaved roads are a function of VMTs, vehicle type, speed, soil surface, moisture, and other factors. Once paved, road emissions are substantially reduced. Asphalt paving would cost about $430,000 per mile, assuming a two-lane road.

The Imperial County Public Works Director provided the ICAPCD with a list of about 50 road segments totaling 23 mi (37 km) that could be paved to reduce fugitive dust emissions. Applying the ARB-derived reduction factor of 2.7 lb (1.2 kg) per VMT for unpaved roads, and measurement of the average frequency of vehicle trips per mile, the number of miles that need to be paved to mitigate a certain amount of PM_{10} emissions can be derived. For example, repaving approximately 23 mi (37 km) of roads could reduce PM_{10} emissions in Imperial County by about 650 tons/yr (589 t/yr).

Retrofitting of Emission Controls on IID Power Plants: Units 2 and 4 of the existing IID steam plant have SCR equipment to control NO_x emissions. Unit 3 does not have SCR equipment, nor do any of the smaller peaker units. The ICAPCD suggested that SCR installation on IID Unit 3 and the peaker units would reduce NO_x emissions in the area of the projects. However, the IID already plans to repower the gas-fired 44-MW Unit 3 in 2007–2008 as a combined-cycle gas-fired unit, at which time the best available control technology would apply and low NO_x emissions would result.

Mitigating to Enhance Use of Compressed Natural Gas in Motorized Vehicles: Four projects were identified as follows: (1) provide $150,000 in funding to maintain the El Centro compressed natural gas refueling facility located at Commercial and Fairfield Streets; (2) provide $250,000 in funding for a compressed natural gas fast-fill facility to be constructed at the Calexico Unified School District; (3) acquire land in Brawley, California, for construction of a compressed natural gas facility at a cost of $250,000 to $500,000; and (4) replace or update engines for the current fleet of ten 40-ft-long (12-m-long) Imperial Valley transit buses and five smaller buses, at a cost of $4 million to $5 million.

The extent to which the portion of such funding toward projects 1, 2, and 3 would contribute to air quality benefits from the creation of a natural gas refueling infrastructure would depend on, among other factors, the unknown degree to which the use of natural gas as an alternative fuel was adopted countywide, and thus cannot be easily estimated. Project 4, however, does offer some guidance as to what air quality benefits could be achieved. The State of California has led a multiagency research effort to study emissions from in-use compressed natural gas and diesel transit buses (ARB 2004b). Particulate emission reduction from diesel buses was a primary goal of the use of compressed natural gas as an alternative fuel. ARB demonstrated an approximate 80-mg/mi particulate reduction (a two-third reduction). If it is conservatively assumed that the current fleet of buses has an aggregate annual mileage of 500,000 mi/yr (804,673 km/yr) and that a larger 100-mg/mi particulate reduction was achieved due to an older fleet base, then it would follow that an overall reduction of approximately 0.1 tons (0.1 t) per year of particulates would result.

Controlling Imperial County Airport Dust: Fugitive dust from natural windstorms and from aircraft (particularly from helicopter landings) occurs frequently at the airport. Funding of $150,000 would be needed either to begin treatment of bare desert soils with either chemical dust retardants or to purchase crushed rock to cover the soil surface in the most sensitive areas. The ICAPCD was not able to provide estimates of the amount of land area that would require treatment for fugitive dust control at the airport (Pentecost and Picel 2004).

Given that the land area for Imperial County extends to 4,175 mi^2 (10,813 km^2), from which approximately 124,000 tons/yr (112,000 t/yr) of fugitive dust is generated (ARB 2003b), the relative effectiveness of dust suppression on available land surface for treatment at the airport would likely be very small. That is, in the absence of information from the ICAPCD, if it is assumed that 0.5 mi^2 (1.3 km^2) of airport land was treated such that no fugitive emissions were emitted, and if a pro rata county land area/county emission rate was also assumed, then a reduction of up to 15 tons/yr (14 t/yr) of particulates could be considered to be a conservative estimate for this mitigation strategy.

Retrofitting of Diesel Engines for Off-Road Heavy-Duty Vehicles: This mitigation measure pertains to updating the diesel engines of off-road vehicles used in agriculture, earthmoving, or construction, to reduce particulate and gaseous emissions. Estimated funding of $250,000 would be needed for conversion to more efficient engines with fewer emissions.

The funding estimate of $250,000 may allow conversion of approximately 50 to 100 heavy-duty diesel engines, depending on the chosen retrofit strategy. Flow-through oxidation catalysts reduce soluble organic fractions (80%), and particulates (25% to 50%) and/or diesel particulate trap oxidizers reduce particulates (25% reduction). For example, total overall particulate engine emissions could be reduced by approximately 3.3 tons/yr (3 t/yr); this value, however, would highly depend on the details of any actual retrofit program.

4.3.6.2 Mitigation Measures in Mexico

While the above opportunities for mitigation have been identified in Imperial County, the available Emission Reduction Credits are relatively limited overall. Opportunities in the Mexicali region of Mexico are apparently more abundant and could yield greater cost-effectiveness. Evaluation of mitigation measures in Mexico is not required under NEPA; however, these issues are included here for disclosure purposes. A further consideration of mitigations in Mexico is that they would be located in the state of the emission source being mitigated (Mexico), while benefits in Imperial County would also accrue to the extent the mitigations impact air quality there.

It is possible that some mitigation measures may be more efficacious if applied in Mexico. The presentation of these measures in this EIS is intended to be conceptual and is not meant to imply the resolution of issues related to appropriateness or enforceability with respect to their actual implementation.

The following examples are identified as measures that could improve air quality. In brief, improvements in air quality could be achieved through a program to replace older automobiles and buses in the Mexicali area with a newer, less polluting fleet. Also, fugitive dust could be reduced through road paving. Air pollutants emitted by industries that use brick kilns could be reduced by converting the fuel used in firing the kilns to natural gas.

The primary regional sources of PM_{10} in the Mexicali region are fugitive emissions from the many unpaved roads (i.e., roads not covered by concrete or asphalt). Such a program has the advantage of, once undertaken, being passively verifiable and measurable. An example of such an initiative in Mexico already under way is the "Paving and Air Quality Project for the State of Baja California" program (BECC 2004b), which is taking place under the auspices of the Border Environment Cooperation Commission (Comisión de Cooperación Ecológica Fronteriza). The State Public Works Agency (Secretaría de Asentamientos Humanos y Obras Públicas del Estado de Baja California) proposes to pave streets in the five major cities in the State of Baja California, namely, Tijuana, Mexicali, Ensenada, Tecate, and Rosarito, to reduce regional PM_{10} emissions. The goal of this program is to pave more than 80% of the streets in 5 years. As this program states: "There are no international treaties or agreements related to this project. However, due to the fact that the border Cities have shared air basins, this project will have positive impacts in both sides of the border."

PM_{10}, and in particular $PM_{2.5}$, emissions could also be mitigated by stationary diesel engine upgrades (e.g., diesel pumping stations or replacement by alternative power sources) and diesel engine vehicle fleet upgrades. However, such a program would be more complex to implement and measure.

Vehicles are the major regional source of NO_2 and CO in Mexicali. Thus, a mitigation program could focus on vehicle inspection and a vehicle retirement program for older Mexicali vehicles.

4.4 BIOLOGICAL RESOURCES

4.4.1 Major Issues

Major issues pertaining to biological resources include impacts of the proposed transmission lines on native ecosystems, potential impacts of water use by the power plants on the ecology of the Salton Sea, impacts on threatened and endangered species that may exist along the transmission lines, and potential impacts to birds protected by the Migratory Bird Treaty Act.

4.4.2 Methodology

Direct impacts and indirect impacts to biological resources are evaluated in this chapter. For ecological resources, direct impacts are limited to those caused by the construction of transmission lines between the U.S.-Mexico border and the IV Substation. Direct impacts are based on the amount of various types of habitat disturbed by movement of equipment and materials, construction and installation of transmission towers and conductors, and construction of access roads for construction and maintenance of the transmission lines. Because construction impacts would be restricted to BLM lands in the Yuha Desert Management Area, there would be no direct impacts to biological resources associated with the New River or the Salton Sea.

The indirect impacts evaluated in this chapter include potential effects to biological resources associated with the New River or the Salton Sea from changes in water quantity and water quality due to operation of the TDM and LRPC power plants. There is no potential for water quantity or quality changes in the New River to affect biological resources in the vicinity of the proposed transmission lines.

4.4.3 No Action

4.4.3.1 Transmission Line Routes

Under the no action alternative, there would be no construction of additional transmission lines in the United States. Thus, there would be no impacts to biological resources from construction and operation of the proposed transmission lines.

4.4.3.2 New River and Salton Sea

Under the no action alternative, the TDM plant would not operate and the EAX unit at the LRPC would operate. Because the EAX unit uses about 69% of the water used by the entire LRPC, impacts to biological resources in the New River due to changes in water quality and volume under the no action alternative would be smaller than impacts from operation of the entire LRPC, compared with impacts from no plants operating.

The slight change in average water depth of 0.6 in (1.5 cm) at the Westmorland gage on the New River under the no action alternative would not adversely affect riparian vegetation or aquatic organisms. There would be either no effect or a very small negative effect on riparian vegetation from a slight change in the groundwater level in the immediate vicinity of the New River from operation of the EAX unit.

The decrease in COD and phosphorus concentrations projected at the Calexico gage would result in DO concentrations that would improve the survival of fish and invertebrates in the New River. Also, small changes in salinity, COD, phosphorus, and DO are not likely to change the extent of riparian vegetation or the species that utilize this habitat.

Operation of the LRPC alone would reduce the quantity of selenium loading in the New River by less than 0.16% of that reported for the Calexico gage. By the time water would have traveled more than 20 river miles to the Brawley wetland, selenium loads and concentrations would be lower, assuming no reduction occurs in the flow rate of the New River.

Immobilization of selenium occurs in sediments, particularly in slow-moving and standing waters such as the wetlands (Lemly 1997). No data were available for selenium concentrations in sediments or water at the Brawley wetland; therefore, there was no evaluation of impacts to wetland vegetation. Since the total load of selenium to the New River would be reduced by operation of the power plants, and flow rate reductions from power plant water use would not likely reduce water depth in the stretch of the river that supplies water to the Brawley wetland, adverse impacts to vegetation or the species that utilize this habitat are not expected.

Under the no action alternative, there would be indirect effects on biological resources of the Salton Sea. The time to reach a salinity level of 60,000 mg/L (a concentration detrimental to fishery resources) would be about 36.06 years, compared with 36.07 years with no plants operating (Table 4.2-7). These values are statistically indistinguishable; thus salinity levels in the Salton Sea would occur at essentially the same rate with or without the EAX unit operating. The aquatic invertebrates and fish inhabiting the region of the Salton Sea receiving inflow from the New River should not be adversely impacted by low DO events from entrophication because phosphorus loading would be reduced by EAX unit operations.

4.4.4 Proposed Action

4.4.4.1 Transmission Line Routes

Construction of the proposed transmission lines along the routes indicated would require traversing approximately 6 mi (10 km) of desert habitat between the U.S.-Mexico border and the IV Substation. The following estimates of land disturbance were based on design information. construction of tower bases and new access roads would permanently impact approximately 3.1 acres (1.3 ha) of Sonoran creosote bush scrub and 0.3 acre (0.1 ha) of desert wash habitat adjacent to the existing SDG&E transmission line route. There would also be temporary impacts to approximately 15 acres (6.0 ha) of Sonoran creosote bush scrub and 0.5 acre (0.2 ha) of desert wash. The acreage of Sonoran creosote bush scrub temporarily impacted would include the area of potential effects for the transmission lines east and north of the IV Substation (9.5 acres [3.8 ha]). In addition, the calculation of impacts for both vegetation community types is conservative because it does not account for the overlap of temporary impacts from work areas and pull sites at the lattice tower and monopole locations.

Constructing the transmission lines on the alternative routes located to the west or east of the existing SDG&E transmission line (as described in Section 2.2.1.5) would increase the area of terrestrial habitat that would be affected because both alternative routes would be longer than the more direct proposed routes. Traversing the additional distances of the alternative routes would require the installation of additional tower structures. The western alternative routes would be approximately 2 mi (3.2 km) longer, would permanently disturb approximately 9.5 acres (3.8 ha) more than the proposed routes, and would require the installation of about 10 additional transmission line towers. The eastern alternative routes would be approximately 0.5 mi (0.8 km) longer, would permanently disturb an additional 6.8 acres (2.6 ha) of terrestrial habitat, and would require the installation of three additional transmission line towers. Also, both of the alternative transmission line routes would require construction of new access roads, whereas the proposed transmission line routes would primarily utilize access roads already present along the existing transmission line. Because both alternative routes would traverse Sonoran Desert scrub and dry wash habitats that are similar in composition to those that would be traversed by the shorter routes, it is anticipated that biological resources similar to those described below for the proposed transmission line routes would be affected, although the magnitude of impacts would be proportionally greater.

Regardless of which transmission line route is selected, there is a potential for construction activities to introduce noxious or invasive plant species to the existing desert habitats. Vehicles moved from one construction site to the next sometimes introduce nonnative or invasive plants by transporting seeds that may be clinging to vehicle structures or that have been incorporated into soil adhering to the vehicle. In addition, the potential for establishment of invasive plants can be increased when construction vehicles alter the structure of existing soils through compaction or excavation, which alter the ability of native plants to compete with introduced plant species. The risk of introducing invasive plants can be reduced by thoroughly cleaning construction vehicles (or maintenance) before moving them to a new site and by minimizing the area affected by vehicular traffic.

Watering may be used for dust control during construction. Watering, especially when combined with disturbance of the ground surface, may create conditions where invasive nonnative plant species can grow. This appears to have occurred in the past where a stand of tamarisk has become established east of the IV Substation in the area of the proposed transmission line routes.

General impacts to wildlife in the area of the projects may occur because of increased human activity and noise during construction activities. Birds and large mammals are highly mobile and would likely move out of the way during construction. Many small terrestrial animals may do the same, but some small mammals and reptiles with low mobility may be inadvertently killed by the movement of materials and heavy equipment during construction.

After construction is completed, a relatively low acreage of habitat dispersed over the proposed routes would be permanently lost as vegetated wildlife habitat because of the placement of foundations for transmission line towers and because of soil disturbance in spur road areas. However, even new roads may have some residual habitat value (e.g., as basking areas for reptiles). Because development of new access roads would be required for construction of transmission lines along the longer eastern and western alternative routes than along the proposed routes, greater amounts of temporary and permanent habitat would be disturbed if the alternative routes were utilized.

Bird species, such as neotropical migrants that are protected by the Migratory Bird Treaty Act, would not be adversely impacted by construction of the proposed transmission lines. No clearing would remove trees or shrubs used by migrating song birds along the proposed and alternative routes. Shrubs and trees used by neotropical migrants moving through desert areas occur typically along desert washes and streams. Streams with water and dry washes lined with shrubs and trees do not exist along the proposed and alternative transmission line routes.

Raptors that occur along the proposed and alternative transmission line routes could use the towers as perching sites. There would be no impact to raptors from electrocution when landing on the towers because the spacing between the conductors and ground wire on the top of the towers exceeds the wing span of the bald eagle (the largest raptor that likely could occur in the area of the projects).

Construction of the transmission lines would not impact any plants or animals Federally listed as threatened or endangered, but could potentially destroy some plant species considered sensitive by the California Native Plant Society. These impacts could occur as a direct result of construction activities or as an indirect impact if invasive plants were accidentally introduced.

No wetlands would be affected by the proposed projects within the transmission line routes, but a total of 0.21 acre (0.08 ha) of desert wash areas, which are considered to be waters of the United States under the jurisdiction of the U.S. Army Corps of Engineers through Section 404 of the CWA (i.e., navigable waters), would be affected along the proposed transmission line routes. This impact would result from placement of tower footings and access roads in the desert wash areas. The largest wash area is Pinto Wash (Figure 3.2-21). These projects would not require a permit from the U.S. Army Corps of Engineers. Nationwide Permit No. 12 covers projects that do not exceed 0.50 acre (0.20 ha) of impacts to wetlands. The area of desert wash habitat within the eastern and western alternative transmission line routes has not been formally surveyed or quantified, but would likely be similar to that within the proposed transmission line routes.

The area in which the transmission lines would be constructed is located within the Yuha Basin ACEC and the Yuha Desert Management Area for the flat-tailed horned lizard, a species of special interest to BLM. The applicants have agreed to mitigation measures to minimize impacts (Section 2.2.1.4) to the flat-tailed horned lizard, the western burrowing owl, and other species that BLM considers sensitive biological resources, as indicated in Table 3.4-2. These include measures listed in the *Flat-tailed Horned Lizard Rangewide Management Strategy* (hereafter referred to as the Strategy) (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003) to mitigate the effects of projects in the Yuha Desert Management Area.

The flat-tailed horned lizard is active during most of the year, but is dormant and hibernates between approximately November 15 and February 15. Hibernation is obligatory, and the animal hibernates in burrows, usually within a couple inches of the ground surface. In the spring and fall active period, the lizards often move about on the surface during the day. As temperatures rise, flat-tailed horned lizards appear to escape extreme daytime temperatures by retreating to burrows. They forage and are most active during the morning and evening. During the active season, the lizards spend the night below the sand, on the surface, or in burrows. When approached, flat-tailed horned lizards often remain still, relying on camouflage for protection. Because of their cryptic coloration, this strategy makes them difficult to detect.

The applicants would attempt to schedule construction to occur as much as possible during the flat-tailed horned lizard's dormant period (November 15 to February 15) and employ all mitigation measures recommended by the management strategy during that period (Section 2.2.1.4). Construction would be completed as quickly as possible to minimize the length of time that the habitat would be disturbed. However, some construction would probably be necessary during the flat-tailed horned lizard's active period (before November 15 and after February 15). If so, the applicants would employ additional mitigation measures during that period. In addition, the applicants would employ mitigation measures intended to minimize the general disturbance of biological resources and to ensure the restoration of disturbed areas.

Several features of the project, as proposed by the applicants and described in Section 2.2.1.4, would be effective in minimizing harm to biological resources. These include positioning the lattice towers and locating access roads so that permanent disturbance can be minimized. In addition, moving the tower assemblies to their locations in the line by helicopter, rather than assembling them on site, would greatly reduce the amount of disturbance at each tower location. The mitigation recommended in this EIS includes monitoring for flat-tailed horned lizards and western burrowing owls and would help to limit impacts to other sensitive biological resources. Section 2.2.1.4 provides a list of environmental protection measures.

4.4.4.2 New River

Since there would not be any direct construction impacts to the New River, there would be no direct disturbance of riparian vegetation under the proposed action for any of the alternative transmission routes identified in Section 2.2.1.5.

There is a potential for indirect impacts to riparian communities associated with the New River to the extent that operation of the power plants would result in decreases in New River water levels and in the level of the adjoining water table that supports the riparian communities. As identified in Table 4.2-3, the proposed action could result in a maximum decrease in the average annual depth of the New River of approximately 0.13 ft (4.0 cm) at the Calexico gage and 0.07 ft (2.1 cm) at the Westmorland gage. Much of the dominant existing vegetation in the riparian zone (e.g., tamarisk, iodine bush, saltbush, and mesquite) consists of relatively drought-tolerant species. Also, many of the riparian plant species are phreatophytic (i.e., they seek deep water through the growth of long taproots). Therefore, it is anticipated that such small changes in river elevation would result in, at the most, very small changes in the overall area of riparian vegetation cover along the New River.

In addition, potential changes in New River water quality could occur under the proposed action. The estimated total salinity level of 2,766 mg/L is about 150 mg/L higher than for no plants operating and below the 4,000-mg/L water quality objective for the Colorado River Basin (SWRCB 2003). Such a small increase in average salinity would have no effect on the growth of riparian vegetation because the plants have high salinity tolerances.

It is also anticipated that the changes in water depth and water quality would not affect the ability to operate and maintain the Brawley wetland that has been constructed adjacent to the New River as part of a pilot project examining the feasibility of using constructed wetlands to improve water quality in the New River. The small change in estimated water depth if the proposed action is implemented should not hinder the ability to pump water into the constructed wetland, since the water intake for the pump used to supply water to the wetland is located deep enough to remain operational under the slightly reduced flows.

To evaluate potential impacts to wetland plant species from water quality changes, particularly changes in salinity, the salt tolerance of wetland plants needs to be considered. Plant species in these two wetland areas include bulrushes, broadleaf cattail, umbrella flatsedge, and littlebeak spikerush (BOR 2002). While information about the salt tolerance of these species is limited, the California bulrush (*Scirpus* [*Schoenoplectus*] *californicus*) is reportedly capable of surviving salinities of up to approximately 6,000 mg/L. Acceptable salinities for some freshwater wetland plants, such as broadleaf cattail and common spikerush (*Eleocharis palustris*), have been estimated at approximately 4,800 mg/L (Warrance et al. 2003). As identified previously, it is estimated that the average salinity in the New River water at the Calexico gage would be approximately 2,766 mg/L under this alternative. There is approximately a 5% chance that salinity would occasionally exceed 3,400 mg/L (2 standard deviations above the mean value) and a less than 0.01% chance that salinity would exceed 4,000 mg/L. The small change in salinity compared with the no action alternative and the small probability of exceeding the known salinity tolerances of wetland plants indicate that implementing the proposed action is unlikely to affect the wetland area at Brawley.

Operation of the power plants would reduce the quantity of selenium loading in the New River by about 0.16% of that reported for the Calexico gage. By the time water would have traveled more than 20 river miles to the Brawley wetland, selenium loads and concentrations would be lower, assuming no reduction occurs in the flow rate of the New River. Immobilization of selenium occurs in sediments, particularly in slow-moving and standing waters such as the wetlands (Lemly 1997). No data were available for selenium concentrations in sediments or water at the Brawley wetland; therefore, impacts to wetland vegetation were not evaluated. Since the total load of selenium to the New River would be reduced by operation of the power plants, and flow rate reductions from power plant water use would not likely reduce water depth in the stretch of the river that supplies water to the Brawley wetland, adverse impacts to vegetation are not expected.

Because implementation of the proposed action alternative would have a very small to no effect on the riparian or wetland habitats along the New River, there would similarly be a very small to no effect on wildlife communities.

The anticipated water quality changes in the New River are expected to have relatively minor impacts to populations of fish and invertebrates that occur in the river between Calexico and the Salton Sea. Even with the slight increase in average salinity, salinity ranges would remain similar to the levels that have occurred historically and would be unlikely to negatively affect the survival or distribution of fish and aquatic invertebrate species.

Phosphorus, which is largely responsible for causing algal blooms that can result in periods of low DO in the river, would be slightly reduced under the proposed action. However, the estimated levels for phosphorus concentrations and BOD at the Calexico gage are only slightly smaller (0.05 mg/L and 0.6 mg/L less, respectively) than levels that would occur under the no action alternative (LRPC operation only), and potential beneficial changes in distributions of fish and invertebrates as a result are also likely to be small. Overall, it is anticipated that the net effects of slightly reduced flows, slightly increased salinity, and slightly reduced nutrient inputs would have a slight impact on the aquatic organisms in the New River.

4.4.4.3 Salton Sea

Implementation of the proposed action would have indirect effects on Salton Sea biological resources as a result of changes in flows, salinity, and nutrient levels from the New River. With both power plants operating, the estimated time for the Salton Sea to reach a salinity of 60,000 mg/L would be 36.06 years, approximately the same as the estimated time under no action (i.e., 36.07 years) (Table 4.2-7). Biological resources would be impacted by increasing salinity before this critical level would be reached, and salinity would be expected to continue to increase under this alternative at a rate similar to that which would occur under the no action alternative.

In the nearer term, the proposed action would result in an estimated annual phosphorus load to the Salton Sea via the New River of approximately 1.305 million lb (0.592 million kg), a decrease of about 3.7% compared with the estimated phosphorus loading with no plants operating. This decrease in phosphorus loading would likely reduce eutrophication of the area of the Salton Sea receiving the inflow and could reduce the frequency (compared with no plants operating) with which low DO events cause mortality of fish and aquatic invertebrates in that portion of the Sea. As long as salinity levels have not reached levels critical for survival of aquatic resources, this could result in increased availability of food resources for birds and other wildlife that utilize the Salton Sea.

Waterfowl and wading birds that migrate through the area or are summer residents of the Salton Sea are also protected under the Migratory Bird Treaty Act. Since there would be only a very small reduction in the water level in the Salton Sea (i.e., –.05 ft [–0.15 m]; Table 4.2-6) from operation of the power plants under the proposed action alternative, no impacts would occur to the feeding habitat of waterfowl and wading birds.

4.4.5 Alternative Technologies

This alternative evaluates the impacts of more efficient emissions control technologies and/or an alternative cooling technology. The following addresses impacts to transmission line routes, the New River, and the Salton Sea from the use of a wet-dry cooling system. Impacts to biological resources from the use of more efficient emissions control technologies would be essentially the same as for the proposed action and therefore are not presented here.

4.4.5.1 Transmission Line Routes

The method used to cool power plants would not affect the potential impacts to biological resources associated with construction and operation of the proposed transmission lines.

Consequently, the impacts to biological resources under this alternative would be the same as those described for the proposed action in Section 4.4.4.1.

4.4.5.2 New River

The potential for indirect impacts to riparian communities and aquatic communities associated with the New River would be reduced if a wet-dry cooling technology was implemented due to lower water consumption. As described in Section 4.2.5, the use of a wet-dry cooling technology would result in water consumptions less than those identified for the proposed action (wet cooling) alternative. Wet-dry cooling would result in less potential for impacts compared with the wet cooling system under the proposed action. However, impacts to biological resources associated with the New River resulting from implementation of a wet-dry cooling system would be small.

4.4.5.3 Salton Sea

The potential for some indirect impacts to biological resources in the Salton Sea would be reduced if a wet-dry cooling system was implemented. As described in Section 4.2.5, the use of a wet-dry cooling technology would result in water consumptions less than those identified for the proposed action (wet cooling) alternative. Impacts to biological resources associated with the Salton Sea resulting from implementation of either the proposed action or the wet-dry cooling technology alternative would be small.

4.4.6 Mitigation Measures

Under this alternative, the expected impacts to biological resources would depend on the nature of the mitigation measures. Measures that would offset reductions in flow volume in the New River would improve the overall water quality in the New River and ultimately the Salton Sea, and thus have a positive impact on biological resources.

For measures to offset air quality impacts, if the paving of roads was selected as the mitigation measure to be employed, a review for proximity to Federal, State-protected, or sensitive species would be necessary to ensure that they are not impacted during paving. If protected species were likely to be impacted, the USFWS and California Game and Fish Department would be contacted before the start of paving or construction activities.

The need for specific measures to protect biological resources would depend on the location of the resources and the kinds of surface and subsurface disturbance that would be necessary to implement the mitigation measure. DOE and BLM have no information on which to conduct an impact analysis of biological resources at the Imperial County Airport, or potential locations for compressed natural gas fast-fill facilities at the Calexico Unified School District and in Brawley. Also, the ICAPCD did not identify specific plans or specific locations of the compressed natural gas facilities, which would allow the staff to conduct a biological resources impact assessment.

4.4.7 Special Status Species

This section evaluates potential impacts to special status species, including Federal- and State-listed threatened and endangered species and species considered sensitive by the BLM. Potential impacts to special status species from the various alternatives are summarized in Table 4.4-1.

Many of the special status species identified in Section 3.4.4 do not occur within areas potentially affected by the proposed projects, including Peirson’s milk vetch, Algodones Dunes sunflower, desert tortoise, barefoot gecko, Swainson’s hawk, elf owl, peninsular bighorn sheep, and Palm Springs ground squirrel. Consequently, there would be no impacts to these species under the no action alternative or the proposed action.

4.4.7.1 No Action

As described in Section 4.4.3, it is assumed that there would be no construction of additional transmission lines in the United States under the no action alternative. Because there would be no additional construction within the United States, there would be no impacts to those special status species that may occur in the vicinity of the proposed transmission line routes. Consequently, there would be no effects of the no action alternative on the flat-tailed horned lizard or the bald eagle.

Under the no action alternative, only the EAX unit of the LRPC power plant would be operated. This would produce impacts to water quality and quantity (Section 4.2) greater than those under no plants operating; however, such impacts would be less than those shown for the proposed action because the EAX unit would only use about 69% of the water used when the entire LRPC is operating. Under such operations, water levels, salinity, phosphorus and selenium concentrations, and COD in the New River and in the Salton Sea would remain similar under the no action alternative to the baseline conditions that have resulted in the development of the current ecological communities described in Sections 3.4.2 and 3.4.3. Assuming that these conditions are maintained, there would be no impacts from the no action alternative to special status species that could occur in riparian or aquatic habitats of the New River or the Salton Sea, including the desert pupfish, bald eagle, brown pelican, Yuma clapper rail, southwestern willow flycatcher, Gila woodpecker, or bank swallow.

However, the conditions would be different if neither of the power plants were operating. As described in Section 4.4.3.2, it is estimated that operation of three turbines of the LRPC power plant would result in a decrease in average water depth in the New River of less than 0.6 in. (1.5 cm) at the Westmorland gage, compared with conditions that would exist in the absence of power plant operations. It is also estimated that there would be an increase in salinity

TABLE 4.4-1 Potential Impacts to Special Status Species

	Alternatives			
Species	No Action	Proposed Action	Alternative Technologies	Mitigation Measures
Plants				
Peirson's milk-vetch *Astragalus magdalanae* var. *peirsonii*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.
Algodones Dunes sunflower *Helianthus niveus* ssp. *tephrodes*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.
Fish				
Desert pupfish *Cyprinodon macularius*	No impacts; no changes to habitat conditions compared to current condition.	No impacts; does not occur within Salton Sea areas likely to be affected by potential changes in water levels or water quality.	No impacts; no changes to habitat conditions com-pared to current condition.	Same as proposed action.
Reptiles				
Desert tortoise *Gopherus agassizii*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Potential for impacts if roads to be paved are within desert tortoise habitat.
Barefoot gecko *Coleonyx switaki*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Potential for impacts if roads to be paved are within barefoot gecko habitat.
Flat-tailed horned lizard *Phyrnosoma mcallii*	No impacts; no new transmission lines constructed within occupied habitats.	Potential for habitat disturbance and deaths to individuals within the vicinity of the transmission line routes; impacts would be minimized by implementing protective mitigation measures as identified in Section 4.4.7.4. No impacts in the vicinity of the New River or the Salton Sea.	Same as for proposed action.	Same as for proposed action; potential for impacts if roads to be paved are within flat-tailed horned lizard habitat.

TABLE 4.4-1 (Cont.)

	Alternatives			
Species	No Action	Proposed Action	Alternative Technologies	Mitigation Measures
Birds				
Bald eagle *Haliaeetus leucocephalus*	No impacts.	No impact to slight beneficial impact due to potential small improvement in food availability at the Salton Sea.	No impacts.	Same as proposed action.
Brown pelican *Pelecanus occidentalis*	No impacts.	No impact to slight beneficial impact due to potential small improvement in water quality and food availability at the Salton Sea.	No impacts.	Same as proposed action.
Yuma clapper rail *Rallus longirostris*	No impacts.	No impact to slight beneficial impact due to potential small improvement in food availability at the Salton Sea.	No impacts.	Same as proposed action.
Swainson's hawk (nesting) *Buteo swainsoni*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.
Southwestern willow flycatcher *Empidonax traillii extimus*	No impacts; riparian areas unaffected.	Same as no action.	Same as no action.	Same as no action.
Elf owl *Micrathene whitneyi*	No impacts; does not occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.
Gila woodpecker *Melanerpes uropygialis*	No impacts; riparian areas unaffected.	Same as no action.	Same as no action.	Same as no action.
Bank swallow *Riparia riparia*	No impacts; riparian areas unaffected.	Same as no action.	Same as no action.	Same as no action.

TABLE 4.4-1 (Cont.)

	Alternatives			
Species	No Action	Proposed Action	Alternative Technologies	Mitigation Measures
Western burrowing owl *Speotyto cunicularia hypugaea*	No impacts; no new transmission lines constructed within occupied habitats.	Potential for habitat disturbance and deaths to individuals within the vicinity of the transmission line routes; impacts would be minimized by implementing protective mitigation measures as identified in Section 4.4.7.4. No impacts in the vicinity of the New River or the Salton Sea.	Same as for proposed action.	Same as for proposed action; potential for impacts if roads to be paved are within western burrowing owl habitat.
Mammals				
Peninsular bighorn sheep *Ovis canadensis*	No impacts; not expected to occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.
Palm Springs ground squirrel *Spermophilus tereticaudus chlorus*	No impacts; not expected to occur within potentially affected area.	Same as no action.	Same as no action.	Same as no action.

in the New River of approximately 97 mg/L compared with no power plant operations and a 0.54% decrease in average inflow to the Salton Sea that could result in a slight (but statistically indistinguishable) increase in the rate at which salinity is increasing in the Salton Sea (see Section 4.2 for additional details). There would also be small decreases in the COD and in the phosphorus and selenium loads to the New River and the Salton Sea, compared with the loading that would occur with no power plant operations (Table 4.2-6).

Because it is very unlikely that the estimated small changes in water levels would result in effects on the riparian vegetation communities associated with the New River or the Salton Sea, special status bird species (i.e., southwestern willow flycatcher, Gila woodpecker, and bank swallow) that might be associated with those habitats are unlikely to be affected. The desert pupfish is highly tolerant of elevated salinity and is unlikely to be affected by the slight differences in salinity between operations under the no action alternative (three gas turbines operational at the LRPC power plant) and no plants operating. Decreases in COD and in phosphorus and selenium concentrations would likely have minor beneficial effects on survival of fish and aquatic invertebrates that could result in slight increases in the availability of food resources for birds and other wildlife compared with conditions that would exist in the absence of power plant operations. Thus, while the no action alternative would not adversely impact special status species, the no action alternative may provide a slight benefit compared with no power plant operations to sensitive bird species that eat fish or aquatic invertebrates such as the bald eagle, brown pelican, and Yuma clapper rail.

4.4.7.2 Proposed Action

General ecological impacts of the proposed action are evaluated in Sections 4.4.4.2 and 4.4.4.3. Potential impacts to special status species are described in this section and summarized in Table 4.4-1.

Special status species could be potentially affected by the proposed action through direct impacts from the construction of transmission lines within the eastern portion of the Yuha Desert or through indirect impacts due to changes in water availability or water quality in the New River or the Salton Sea. Special status species with a potential to occur within areas that could be affected by the proposed action include the desert pupfish, flat-tailed horned lizard, bald eagle, brown pelican, Yuma clapper rail, southwestern willow flycatcher, Gila woodpecker, and bank swallow.

As identified in Section 3.4.4.3, the desert pupfish (Federally and State endangered) occurs in shoreline pools along the southern and eastern margins of the Salton Sea and in agricultural drainage canals. It has not been reported from the New River and is not expected to occur there due to the high sediment loads, unsuitable water velocities, and the presence of predators. The desert pupfish is highly tolerant of elevated salinity (up to approximately 98,000 mg/L in the laboratory). It is estimated (see Section 4.2.4.4) that salinity (TDS) in the Salton Sea would increase by approximately 443.76 mg/L/yr under the proposed action (i.e., both power plants operating), compared with 443.74 mg/L/yr under the no action alternative (LRPC EAX unit operation only). This very small increase in the salinization rate for the Salton Sea would be unlikely to affect the desert pupfish, which can adapt to and survive in the highly saline desert pools in which salinity changes rapidly due to evaporation. It is anticipated that the proposed action would not adversely affect desert pupfish in the vicinity of the Salton Sea.

The area in which the transmission lines would be constructed is located within the Yuha Basin ACEC and in the Yuha Desert Management Area for the flat-tailed horned lizard, a BLM-designated sensitive species. The flat-tailed horned lizard is known to occur within the areas that would be affected by the proposed transmission line routes. Consequently, there is a relatively high potential for flat-tailed horned lizard habitats and individuals to be harmed during construction of the transmission lines. These impacts could result from development of additional access or spur roads (new access roads would be needed only for the alternative routes), movement of vehicles or materials across the ground, and excavation of soil for placement of tower foundations.

The applicants have agreed to implement environmental protection measures to minimize impacts to the flat-tailed horned lizard. These measures are identified in Section 2.2.1.4 and include actions listed in the Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003) to mitigate the effects of projects in the Yuha Desert Management Area. In addition to particular actions to specifically reduce the potential for impacts to the flat-tailed horned lizard, the applicants would employ measures intended to minimize and mitigate for general disturbance of biological resources and assure restoration of disturbed areas. Assuming that the specified actions are implemented during construction, no unacceptable impacts to the flat-tailed horned lizard are anticipated as a result of the proposed action.

While there is a potential for bald eagles (Federally threatened and State endangered) to occur within the vicinity of the proposed transmission line routes, it is relatively unlikely because suitable foraging areas (i.e., open bodies of water containing fish) are not located nearby. The bald eagle is highly mobile and would likely move out of the way during construction, thereby reducing the potential for immediate impacts from construction activities. Because the spacing between the transmission lines would be considerably greater than the wingspan of a bald eagle, electrocution would be highly unlikely if the lines are constructed, although there is a potential for isolated deaths through collision with the conductors. However, the transmission line previously constructed within the utility corridor has been in place for approximately 20 years, and no bald eagle deaths due to the presence of the line have been reported during that time.

Bald eagles commonly occur in the vicinity of the Salton Sea and utilize fish (primarily tilapia) in the Sea as a food source. Consequently, bald eagles could be indirectly affected by the proposed action if it resulted in a decline in fish abundance. However, as discussed in Section 4.4.4.3, the small changes in Salton Sea water levels and salinity levels that could result from the proposed action would result in very small and likely undetectable effects on fishery resources. The proposed action would also reduce water nutrient levels in the New River, thereby reducing nutrient loading to the Salton Sea. Because elevated nutrient levels in the Salton Sea have been implicated in large, episodic fish kills, nutrient level reductions could result in slightly improved fish survival and an improved food base for the bald eagle. However, because bald eagles will feed on dead fish as well as live fish, benefits to the bald eagle from nutrient reduction is likely to be relatively minor. Overall, it is anticipated that the proposed action will not result in adverse impacts to the bald eagle.

The brown pelican, a Federally endangered species, is known to occur at the Salton Sea. While there would be no direct impacts to the brown pelican from the proposed construction activities, there is a potential for the brown pelican to be negatively affected if the availability of fish resources were to be reduced as a result of changes in water conditions. As discussed above, the small changes in Salton Sea water levels and salinity levels that could result from the proposed action would result in very small, and likely undetectable effects on fishery resources. Concurrent reductions in nutrient loading to the Salton Sea could result in slightly improved fish survival and an improved food base for the brown pelican and other fish-eating birds. Overall, it is anticipated that the proposed action would not result in impacts to the brown pelican.

The Yuma clapper rail, a Federally endangered and State threatened species, is also known to occur at the Salton Sea. While there would be no direct impacts to the Yuma clapper rail from the proposed construction activities, there is a potential for this species to be negatively affected if the availability of fish and invertebrate food items is reduced by the proposed action. For the same reasons as those presented for the brown pelican, above, it is anticipated that there would be no substantial changes in food availability for the Yuma clapper rail. Consequently, the proposed action would not result in impacts to the Yuma clapper rail.

The southwestern willow flycatcher (Federally and State endangered), Gila woodpecker (State endangered), and bank swallow (State threatened) have a potential to occur within the desert scrub riparian areas associated with the New River. All three species are insectivorous, although the Gila woodpecker also eats fruits and berries on occasion. As discussed in Section 4.4.4.2, the proposed action would not directly (through construction impacts) or indirectly (through small changes in water levels or water quality) alter the extent or composition of the riparian areas along the New River. Furthermore, the small changes in water quality would be unlikely to result in changes in the abundance or composition of aquatic insects that might provide food for these species. Consequently, the proposed action would not affect the southwestern willow flycatcher, Gila woodpecker, or the bank swallow.

The western burrowing owl, a BLM-designated sensitive species, is a year-round resident occurring in low-growing vegetation and in agricultural fields, and occupies burrows of small mammals and holes along culverts. This habitat occurs at various locations adjacent to the New River and in the vicinity of the proposed transmission lines. Construction of the transmission lines has the potential to affect the burrows of any western burrowing owls in tower locations or in areas that would be traversed by construction vehicles. Mitigation to address this potential effect is identified in Section 2.2.1.4.1. Construction of the transmission lines would not impact western burrowing owls during the breeding period because activities would take place between November and February. Because only small changes would occur to water levels in the New River, no impacts are expected to occur to western burrowing owls that may occur in riparian areas.

4.4.7.3 Alternative Technologies

This alternative evaluates the impacts of more efficient emissions control technologies and/or an alternative cooling technology. The following impacts to biological resources from the use of more efficient emissions control technologies would be the same as for the proposed action and therefore are not presented here.

The construction methods and routes for the transmission lines under this alternative would be identical to those identified for the proposed action. Consequently, potential impacts to the flat-tailed horned lizard and the western burrowing owl would be the same as those identified for the proposed action in Section 4.4.7.2.

The use of more efficient emission control technologies would result in no difference in impacts to protected species compared with the proposed action.

The alternative cooling technology would result in a need for less cooling water than the proposed action. While the actual level of water use would depend upon the exact combination of dry and wet cooling technologies, water levels and water quality in the New River and the Salton Sea would still differ only slightly from those identified for the no action or proposed action alternatives. Consequently, it is anticipated that there would be no impacts to the desert pupfish, bald eagle, brown pelican, Yuma clapper rail, southwestern willow flycatcher, Gila woodpecker, or bank swallow from implementation of the alternative technologies alternative.

4.4.7.4 Mitigation Measures

Under this alternative, the expected impacts to protected species would depend on the nature and location of the mitigation measures employed. Site-specific information on the specific biological resources present would need to be obtained prior to implementation of any mitigation measure in order to properly determine the potential for impacts to this resource.

Measures that would offset reductions in flow volume in the New River could slightly improve water quality in the New River and Salton Sea and thus could have a small positive impact on biological resources.

4.5 CULTURAL RESOURCES

4.5.1 Major Issues

There were no major issues raised pertaining to cultural resources.

4.5.2 Methodology

This analysis evaluates the impacts of construction of the proposed and alternative transmission lines on cultural resources. The potential for impacts is identified through examination of the expected activities associated with the projects, with a focus on ground-disturbing activities that would present the greatest potential threat to cultural resources. The locations of construction activities are then compared with the known areas of cultural resources. If a cultural resource could be affected by the projects, cultural resource professionals would need to determine the importance of the archaeological site. If a site is considered important, it may be recommended for listing on the NRHP.

The SHPO for each state maintains the records for all archaeological surveys conducted in that state and the NRHP eligibility of the sites in that state. Because of the size of the State of California, the records are kept at regional office centers. A record and literature search was conducted at the Southeast Information Center of the Office of Historic Preservation for information on archaeological surveys conducted in the area of the projects. The results of this search are presented in Section 3.5. On the basis of the results of the search, areas were identified that required examination for cultural resources. A survey was conducted in the identified areas by RECON Environmental, Inc., of San Diego, California.

BLM sent letters to the appropriate Tribal organizations asking if they had any concerns with the proposed projects. Native American organizations did not respond to these letters; therefore, no concerns were identified.

Once all cultural resources were identified for the area of the projects, additional research was necessary to determine the NRHP eligibility status of the sites that could be affected by the projects. A treatment plan identifying the research strategy for the additional research was drafted, reviewed, and accepted by the California SHPO. The findings from the additional research were presented in a report to BLM (Berryman and Cheever 2001b). On the basis of this report, additional monitoring of two archaeological sites would be required during construction, as described in Section 2.2.1.4.2.

4.5.3 No Action

Under the no action alternative, both Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. Therefore, no impacts to cultural resources would be expected.

4.5.4 Proposed Action

The analysis for this alternative focuses on the 6-mi (10-km) portion of the lines from the U.S.-Mexico border to the IV Substation as it is currently designed and also evaluates the impacts of two alternative routes, one to the east of the existing line but within BLM-designated Utility Corridor N, and the other to the west of the existing line that runs outside the utility corridor and then along the U.S.-Mexico border.

A cultural resources survey was conducted for the proposed routes to ascertain if any cultural resources are present. The survey discovered 9 previously recorded sites[5] and recorded 18 new sites and 34 isolated artifacts (Berryman and Cheever 2001a). All but one of the sites appear to be from the prehistoric period and are likely related to Lake Cahuilla. The historic period site dates to the 1930s. Twenty-three of these sites have been recommended as eligible for NRHP listing.

Of the sites identified, four would be directly impacted under implementation of the proposed action (4-Imp-7875, 4-Imp-3999, 4-Imp-4962, and 4-Imp-4485/4495). Site 4-Imp-7875 is a small, specialized workstation. Site 4-Imp-3999 appears to be a workstation with only a small part of the site within the proposed routes. The portion of the site within the proposed routes has been partially modified by off-road vehicles. The last two sites, 4-Imp-4962 and 4-Imp-4485/4495, appear to be the remains of hunting and gathering activities. The sites show evidence of contacts outside the Imperial Valley. The periphery of these sites would be impacted by the proposed action. There is also the potential for indirect impacts resulting from the creation

[5] A “site” is typically defined as three artifacts in close proximity. For any fewer than that, the find is referred to as “isolated.”

of access roads and spurs, and lay-down areas. A treatment plan for the four potentially eligible sites was developed and approved by the SHPO to mitigate the adverse effects that would result from construction of the transmission lines (Berryman and Cheever 2001a).

The focus of the archaeological fieldwork was the formal determination of NRHP eligibility. Each of the sites that would be impacted by the proposed action was examined to identify the nature and extent of the remains. The results of the examination identified in the treatment plan are presented in Berryman and Cheever (2001b). The report recommended additional monitoring at two of the sites.

The BLM has partially surveyed the western alternative routes for the presence of cultural resources. The western alternative routes were chosen to avoid cultural resources. This would be partially achieved by being west of the Lake Cahuilla shoreline. As a result, the potential for impacts to archaeological resources would be less along the western alternative routes than along the proposed routes. However, the transmission lines in the western routes would run along the U.S.-Mexico border for a greater distance, and the border itself is considered a cultural resource. These routes would have the potential to degrade the appearance of the border by introducing a visual intrusion. If these routes were selected, additional cultural resource surveys would be necessary as well as additional consultation with the California SHPO and the appropriate Native American Tribes.

The eastern alternative routes have been partially surveyed for cultural resources. The use of the western or eastern alternative routes is expected to have a lower potential to impact cultural resources since they would not be located along the Lake Cahuilla shoreline. However, because the complete routes have not been surveyed, additional surveys and consultation with the appropriate Native American Tribes and the California SHPO would be required.

4.5.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change the transmission line configurations as described under the proposed action. Thus, the impacts to cultural resources for this alternative would be the same as those described in Section 4.5.4 for the proposed action.

4.5.6 Mitigation Measures

Under this alternative, the expected impacts to cultural resources would depend on the nature of the mitigation measures. If the paving of roads was selected as a mitigation measure to be employed, a review for proximity to cultural resources would be necessary to ensure that they are not impacted during paving. If cultural resources were to be impacted, the NRHP eligibility status of the sites would have to be evaluated. If found to be NRHP-eligible, protection measures for these sites would have to be developed in consultation with the California SHPO and the appropriate Native American Tribes.

Other mitigation measures described in Section 2.4 would also require consultation with the California SHPO prior to undertaking site construction activities. The need for specific measures to protect or assess cultural resources would depend on the status of cultural resource surveys for the location, the location and NRHP status of the resources, and the kinds of surface and subsurface disturbance that would be necessary to implement the mitigation measure. DOE and BLM have no information on which to conduct an impact analysis of cultural resources at the Imperial County Airport, or on potential locations for compressed natural gas fast-fill facilities at the Calexico Unified School District and in Brawley. Also, the ICAPCD did not identify specific plans or specific locations of the compressed natural gas facilities, which would allow the staff to conduct a cultural resources impact assessment.

4.6 LAND USE

4.6.1 Major Issues

There were no major issues raised pertaining to land use.

4.6.2 Methodology

This analysis evaluates the impacts of the construction of the proposed and alternative transmission lines on land use. The area of the projects is located entirely on BLM-managed land. Land use policy for the region was determined through examination of current BLM planning and management documents for the Yuha Basin ACEC and the region in general. The relevant land use policies are described in Section 3.6.

The analysis examines both the amount of land affected by transmission line construction and how compatible the placing of the lines would be to current land use. The compatibility with current management strategies for that location is also examined. Particular attention is given to any special use areas that would be impacted by construction and operation of the transmission lines (e.g., mining areas) and specially designated management areas. The analysis considers total amounts of land disturbed by construction.

4.6.3 No Action

Under the no action alternative, both the Presidential permits and corresponding ROWs would be denied. Land use in the Yuha Basin ACEC would remain limited because of the number of cultural resources found in the area and the habitat for the flat-tailed horned lizard, a BLM-designated sensitive species. Recreation usage would continue as described in Section 3.6.3.

4.6.4 Proposed Action

The environmental impacts to land use associated with granting of the ROWs would be similar for the proposed and alternative routes. Land use would be restricted along the access roads for the new transmission lines regardless of which routes are chosen. Additional impacts would be incurred for the proposed western and eastern alternative routes because each would require a new restricted access road to be built across the desert. The proposed routes would use the existing limited access road. The total amount of permanent disturbance for the western and eastern alternative routes (13.1 and 10.4 acres, respectively [5.3 and 4.2 ha]) would be higher than for the proposed routes reported in Table 2.2-1 (<3.6 acres [<1.4 ha]). The western alternative routes would run partially outside of BLM-designated Utility Corridor N and would require a plan amendment. Under the proposed and eastern alternative routes, no alteration of current land use plans would be necessary. Locating the transmission lines east or west of the existing line would create new areas with further restricted land use. However, since the entire area is listed as a limited use area and given the small amount of land needed for the transmission lines, this additional limiting of land use would not represent a major impact.

Two locations in the southern portion of the proposed routes were previously used for the mining of sand and gravel. Mining activities have been discontinued in these areas (Marty 2003). The nearest active mining activities are 2.5 mi (4 km) west of the proposed routes and would be unaffected by locating the transmission lines within the proposed or alternative routes.

Recreation activities in the Yuha Basin ACEC are somewhat limited. Travel is allowed on BLM-designated routes only. Routes designated “Limited Use” south of Interstate 8 are restricted to street legal vehicles only. All vehicles are allowed on routes designated “Open.” Parking is permitted adjacent to routes south of Interstate 8 only during daylight hours, except unoccupied vehicles next to the Jacumba Wilderness left by overnight wilderness visitors. Camping is only permitted in designated areas within the Yuha Basin ACEC. There are no designated camping areas within 10 mi (16 km) east or west of the proposed transmission line routes.

No agricultural activities take place on BLM-managed land. Therefore, using the proposed routes on BLM land is not expected to interfere with any agricultural practices. If the eastern alternative routes were chosen, however, there is some potential for interference with crop-dusting activities. The lower portion of the western alternative routes could cross prime farmland soils (Section 3.1.3.3).

The use of the western or eastern alternative routes would require that portions of the transmission lines run parallel to the border. The U.S. Customs and Border Patrol Agency discourages practices of this sort because they would require additional patrolling to ensure the integrity of the lines.

4.6.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change the transmission line configurations as described under the proposed action; thus, land use impacts for this alternative would be the same as those described in Section 4.6.4 for the proposed action.

4.6.6 Mitigation Measures

The expected impacts to land use would depend on the nature of the mitigation measures. For example, if the paving of roads is selected as a mitigation measure to be employed, increased access to certain remote areas that are currently difficult to access could result in adverse impacts to current land use.

4.7 TRANSPORTATION

4.7.1 Major Issues

There were no major issues raised pertaining to transportation.

4.7.2 Methodology

This analysis evaluates the impact of construction and operation on the local transportation network and compares the number of daily trips to the construction site along specific road segments with existing traffic conditions on these routes. Potential changes in the existing levels of service, which take into account road segment capacity and traffic conditions, are evaluated.

4.7.3 No Action

Under the no action alternative, the Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. With no construction traffic, there would be no increases in local traffic, and local conditions would continue as described in Section 3.7.

4.7.4 Proposed Action

Small increases in local traffic would be expected throughout the duration of transmission line construction for the proposed and alternative routes. Workers residing locally, including those residing in the area temporarily, would travel to the construction sites by private vehicles.

In addition, for the proposed routes, 10 workers would be brought to the construction sites from Mexico by bus on a daily basis. Most workers would travel between the El Centro and Calexico areas and the construction site on State Route 98. For the proposed routes, construction traffic would vary across the 5 months of construction, from 18 round-trips in the first 2 months, falling to 8 in the third month and to 5 in the last 2 months. Given current levels of service on State Route 98 and the relatively low traffic volumes associated with the proposed action, no impact on existing levels of service over local segments of State Route 98 are expected for any of the routes.

4.7.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change the traffic volumes associated with transmission line construction as described under the proposed action; thus, transportation impacts for this alternative would be the same as those described in Section 4.7.4 for the proposed action.

4.7.6 Mitigation Measures

Impacts to local transportation networks would depend on the nature of the mitigation measure. In the short-term, any mitigation-related construction project would increase local traffic.

4.8 VISUAL RESOURCES

4.8.1 Major Issues

There were no major issues raised pertaining to visual resources.

4.8.2 Methodology

This analysis evaluated the potential impacts of the proposed transmission lines on visual resources. The analysis covers (1) the addition of lines along the existing IV-La Rosita transmission line, (2) eastern alternative routes located between the existing line and the Westside Main Canal, and (3) western alternative routes heading south from the substation to the U.S.-Mexico border and then heading east to the existing border crossing point.

The evaluation criteria used to assess the impact of these facilities included distance, contrast, angle of observation, duration of view, relative size of the project, and light conditions within the vicinity of each facility. Generally, visibility impacts from roadways are not considered to be as sensitive as views from recreational areas or residences, with the duration and role of specific views to individuals being keys to the significance of impacts. However, with very little recreational activity and few residential locations in the vicinity of the proposed and alternative routes, road users constitute the largest single number of viewers of the transmission lines.

To evaluate the impacts of the three routes on road users, data from key observation points established along State Route 98 were used. These points were located 0.7 mi (1.1 km) east of the existing line and 1.3 mi (2.1 km) east of the existing line at the location of the nearest residence. Photographs from these observation points are shown in Figures 4.8-1 and 4.8-2. Figure 4.8-1 shows the actual view of the existing IV-La Rosita lines from observation point 1. Figure 4.8-2 is a simulated view of the eastern alternative lines (the existing lines are in the background).

4.8.3 No Action

Under the no action alternative, the Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. No changes in landscape contrast would occur, and the area in the vicinity of the proposed lines would maintain a Class III VRM rating.

4.8.4 Proposed Action

The area in the vicinity of each facility is classified as a Class III Visual Resource Inventory Area (see Section 3.8.4). VRM Class III objectives stipulate that the existing character of the landscape should be partially retained and that any level of change should be moderate.While landscape changes may attract attention, they should not dominate the view of casual observers (BLM 1986b).

FIGURE 4.8-1 Actual View from Key Observation Point 1, 0.7 mi (1.1 km) East of Existing IV-La Rosita Line on State Route 98

FIGURE 4.8-2 Simulated View of the Eastern Alternative Lines (foreground) from Key Observation Point 2, 1.3 mi (2.1 km) East of Existing IV-La Rosita Line on State Route 98

The photo simulation of the eastern alternative routes (Figure 4.8-2) indicates that the addition of transmission lines would be a prominent addition to the existing landscape for road users. While additional lines along the proposed routes would be a visible feature of the landscape, the lines would be constructed by using steel lattice towers similar to those of the existing line, where the natural light and background landscape elements that show through the structures would diminish the impact of the additional line on the landscape. Given the type of construction used for the towers, the visual impression of the towers would also lessen considerably with distance from the line. Similarly, the view from the nearest residence, located 1.3 mi (2.1 km) east of the existing line (observation point 2, Figure 4.8-2), would not be impacted substantially, given the location of the existing line and the landforms and vegetation between this location and the proposed routes.

Transmission lines built along the alternative eastern and western routes would have impacts similar to those along the proposed routes. Although the lines of the western alternative routes would diverge from those of the existing line, the majority of the divergence would occur south of State Route 98 in a relatively remote part of the county with no readily accessible or inhabited locations. The majority of the alternative western routes north of State Route 98 and the entire stretch of the eastern alternative routes would be within 0.5 mi (0.8 km) of the existing line. Because of the routes' proximity to the existing line, views to road users from key observation points on either side of the transmission routes are not likely to differ substantially between the alternative routes. However, the location of the eastern alternative routes would be closer to the nearest residence and would therefore be a larger aspect of the landscape than lines constructed along either of the other routes (Figure 4.8-2).

Construction and operation of the transmission lines would meet the visual contrast criteria established under the objectives for VRM Class III, whereby the existing character of the landscape would be partially retained, with any level of change being moderate. The project would attract attention to viewers in the area, but it would not dominate views. A number of measures might be used to mitigate the visual impacts of the lines on people traveling along State Route 98, including the reduction of the use of shiny metal surfaces on transmission towers or the treatment of these surfaces to allow blending with prominent desert background colors.

4.8.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change the transmission line configurations as described under the proposed action; thus, impacts to visual resources for this alternative would be the same as those described in Section 4.8.4 for the proposed action.

4.8.6 Mitigation Measures

The impacts to visual resources would depend on the nature of the mitigation measures. For example, the ICAPCD indicated that a compressed natural gas fast-fill station would be similar in appearance and size to a gasoline service station. Thus, the heights of structures would not cause a visual contrast that would attract the attention of viewers.

4.9 NOISE

4.9.1 Major Issues

There were no major issues raised pertaining to noise impacts.

4.9.2 Methodology

Potential noise impacts under each alternative were assessed by estimating the sound levels from noise-emitting sources associated with construction and operations, followed by noise propagation modeling. Examples of noise-emitting sources include heavy equipment used in earthmoving and other activities during construction. Potential noise levels due to these sources were obtained from the literature (HMMH 1995). The proposed transmission lines would be located in a desert area with a naturally occurring background noise level of approximately 35 dB(A) (Miller 2002). For construction, detailed information on the types and number of construction equipment required is not available. Therefore, for the construction impact analysis, it was assumed that the two noisiest sources would operate simultaneously directly under the transmission line (HMMH 1995). For the operations impact analysis, data on noise levels at varying distances from a 230-kV transmission line during rainy conditions were obtained from the literature (Lee et al. 1996). Noise levels at the nearest residence from the alternative routes were estimated by using a simple noise propagation model on the basis of estimated sound levels at the source. The significance of estimated potential noise levels at the nearest residence was assessed by comparing them with the EPA noise guideline (EPA 1974) and measured background noise levels.

4.9.3 No Action

Under the no action alternative, the Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. Noise levels would continue at background levels of about 35 dB(A).

4.9.4 Proposed Action

4.9.4.1 Construction

During construction of the transmission lines, daytime noise would increase in areas located near the ROWs. Typical noise levels for construction would be about 90 dB(A) at a distance of 50 ft (15 m) from the operating equipment, assuming two pieces of equipment are operating simultaneously (HMMH 1995).

Noise levels decrease about 6 dB as the distance from the source doubles because of the way sound spreads geometrically over an increasing distance. The nearest residence to the proposed routes is located 6,900 ft (2,100 m) directly to the east along State Route 98. At this location, noise from construction activities would be 48.6 dB(A). This level would be about 43.8 dB(A) as day-night average sound level (DNL), if construction activities are assumed to be limited to an 8-hour daytime shift. This value is below the EPA guideline level of 55 dB(A) for residential zones, which was established to prevent interference with activity, annoyance, or hearing impairment (EPA 1974). The western alternative routes would be even farther from any residence, and again, the noise impacts during construction would be below the EPA guidance level.

If the eastern alternative routes were used, the distance to the nearest existing residence would be decreased to about 360 ft (109 m) from the center of the ROW along State Route 98. At this distance where construction activity would occur at any one time, the estimated noise level would be 74.3 dB(A) and 69.5 dB(A) as DNL for an 8-hour daytime shift. This value is much higher than the EPA guideline of 55 dB(A) as DNL. However, this construction activity near the residence would be limited to a short duration (less than 1 week) and then move to the next tower. These estimates are probably an upper bound because they do not account for other types of attenuation, such as air absorption and ground effects due to terrain. Since this impact is associated with the construction phase only, it would be temporary and short-term.

4.9.4.2 Operations

There is a potential for noise impacts associated with operation of the transmission lines from corona, which is the electrical breakdown of air into charged particles, caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. Modern transmission lines are designed, constructed, and maintained so that during dry conditions they will operate below the corona inception voltage; that is, the line will generate a minimum of corona-related noise. During dry weather conditions, noise from the proposed transmission lines would be generally indistinguishable from background noise (35 dB(A) DNL or less) at locations beyond the edge of the ROW (Lee et al. 1996). During very infrequent rainfall events, the noise level at the edge of the ROW would be less than 39 dBA (Lee et al. 1996). This is a low level (typical of the noise level in a library). Because of the arid climate in the region and the distance of receptors from the ROW, the impact of corona-generated audible noise during operation of the proposed and alternative routes is expected to be negligible.

Occasional maintenance activities on the transmission lines and substation would be required. Noise impacts from these activities would be intermittent.

4.9.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change the noise levels associated with transmission line construction or operation as described under the proposed action; thus, noise impacts for this alternative would be the same as those described in Section 4.9.4 for the proposed action.

4.9.6 Mitigation Measures

The noise impacts under this alternative would depend on the nature of the mitigation measure. For example, one mitigation measure could be paving roads. This would cause short-term noise impacts from operation of the road paving equipment, especially if the road paving occurred near residential areas. Another mitigation measure, retiring older automobiles, could have beneficial noise impacts (reduction of noise).

4.10 SOCIOECONOMICS

4.10.1 Major Issues

There were no major issues raised pertaining to socioeconomic impacts.

4.10.2 Methodology

Socioeconomic impacts for the proposed and alternative routes were assessed by using data on direct construction employment, employee residential location, cost, and schedule. For this analysis, it was assumed that any variation in the line length between the proposed and alternative routes would be reflected in the project construction schedule and cost rather than in increases in employment in the various occupations involved in constructing the project. Expenditures in each labor and material category were simply scaled on the basis of the line length for each alternative. Construction workforce data for each alternative were combined with data on project material expenditures and used to calculate the indirect impacts of the projects by using IMPLAN input-output regional data (Minnesota IMPLAN Group, Inc. 2004) for Imperial County. Impacts were evaluated for (1) population, housing, and local public services; (2) employment and income; and (3) government revenues.

4.10.3 No Action

Under the no action alternative, the Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. Local economic activity would continue at the levels described in Section 3.9.

4.10.4 Proposed Action

4.10.4.1 Population, Housing, and Local Public Services

Although a small number of workers are expected to temporarily relocate to Imperial County during construction of the proposed transmission lines, these workers would reside in the county for a maximum of only 5 months, and it is unlikely that the relocated workers would be accompanied by their families. Impacts of the project on the population would therefore be minimal. No impacts to local housing markets are expected, as it is assumed that in-migrating workers would occupy temporary accommodations, with no impact on the local rental housing market. With only a small number of temporary in-migrants, impacts on local public services, including police and fire protection, educational and other local government services, and health and medical resources, would also be minimal.

No new jobs would be created in Imperial County to operate the transmission lines; consequently, no permanent in-migration or population impacts are expected.

4.10.4.2 Employment and Income

Construction of the transmission lines along the proposed or alternative routes would create a small amount of direct and indirect economic activity in the county (Table 4.10.1). Construction along the proposed routes would create 69 direct jobs. There would be no increase in direct employment for the alternative routes. However, since the alternative routes are longer than the proposed routes, slightly more time would be required for construction, with additional labor and material expenditures required to complete lines along these routes. Wage and salary expenditures and material procurement associated with direct expenditures for each alternative route would produce indirect employment impacts ranging from 23 for the proposed routes, to 25 for the eastern alternative routes, and 32 for the western alternative routes. The total employment impact would be 92 for the proposed routes, 94 for the eastern alternative routes, and 101 for the western alternative routes. None of the routes would impact the county employment growth rate for 2002 by more than 1/100th of a percentage point.

Longer construction durations for the alternative routes are reflected in both the direct and indirect labor income impacts (Table 4.10-1). Construction along the proposed routes would produce $1.4 million in direct income and an additional $0.5 million in indirect income, with $1.9 million in income produced in total. Slightly more total labor income would be produced by the eastern and western alternative routes ($2 million and $2.6 million, respectively) compared with the proposed routes.

No new jobs would be created in Imperial County to operate the transmission lines; consequently, no additional employment or income would be generated from line operations.

4.10.4.3 Government Revenues

Impacts of the projects on local government revenues would be slight, with small differences between the proposed routes and the two alternative routes. Sales taxes generated directly by project expenditures and indirectly through the overall increase in economic activity resulting from wage and salary expenditures and material procurement would amount to roughly $25,900 for the proposed route, $27,300 for the eastern alternative routes, and $34,900 for the western alternative routes (Table 4.10-1).

A small number of employees would stay in temporary accommodations for the duration of the project, producing tax revenues through the motel occupancy tax. These revenues would range from $6,900 for the applicants' proposed routes, $7,300 for the eastern routes, and $9,300 for the western routes.

TABLE 4.10-1 Economic Impacts of the Proposed and Alternative Transmission Line Routes in Imperial County in 2002[a]

Parameter	Proposed Routes	Eastern Alternative Routes	Western Alternative Routes
Jobs (number)			
Direct	69	69	69
Total	92	94	101
Labor income (10^6) ($2003)			
Direct	1.4	1.5	1.9
Total	1.9	2.0	2.6
Sales taxes ($2003)	25,900	27,300	34,900
Motel occupancy taxes ($2003)	6,900	7,300	9,300
BLM lease rental payments ($2003)	2,180	2,300	1,934

[a] Impacts to income and taxes are for 2002, expressed in 2003 dollars.

In addition to tax revenues generated by the projects for local and State governments, the projects would also generate lease rental revenue for the Federal government through payments made to BLM. These would range from $2,180 for the proposed routes, to $2,300 for the eastern routes, and $1,934 for the western routes (Table 4.10-1).

4.10.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not produce changes in employment, housing, or government revenues associated with transmission line construction as described under the proposed action; thus, socioeconomic impacts for this alternative would be the same as those described in Section 4.10.4 for the proposed action.

4.10.6 Mitigation Measures

Socioeconomic impacts would depend on the nature of the mitigation measures. However, in general, measures are likely to create local employment as a result of hiring and material procurement. Mitigation-related wage and salary spending and material expenditures would have a beneficial effect on the overall level of economic activity in the county.

4.11 HUMAN HEALTH

4.11.1 Major Issues

Major issues pertaining to human health include (1) particulate matter (PM) emissions associated with transmission line construction activities; (2) power plant emissions of particulates (PM_{10} and $PM_{2.5}$) and NO_x; (3) releases of NH_3 by emission control equipment installed on the power plants; and (4) potential impacts to individuals with asthma caused by exposure to O_3, a secondary pollutant.

4.11.2 Methodology and Background

The health impacts analysis related to construction and operation of the proposed and alternative transmission lines evaluates the potential effects of electric and magnetic fields (EMF). Values expected for the field strengths along the transmission lines were taken from the existing published literature, as was information that correlated field strengths with potential health effects. In this analysis, the magnetic field estimates at various distances from the ROW were compared with background levels of less than 1 milligauss (1 mG; 0.1 microtesla [0.1 μT]) and with levels associated with increased health risks (generally above 4 mG, or 0.4 μT). (Because magnetic field strengths are more often given in terms of mG than μT in the literature, the mG unit is used exclusively in the impacts section of this EIS.) The field strength at the nearest residence (1.3 mi [2.1 km] to the east of the proposed routes) was estimated to assess the likelihood of adverse effects for residents at that location.

The health impacts analysis related to power plant emissions evaluated particulates (PM_{10} and $PM_{2.5}$), NO_x, and NH_3. NO_x is known to lead to increased O_3 levels under certain conditions, as described previously in Section 4.3. Concentrations of these pollutants based on air modeling results were compared with pollutant concentrations known to impact human health from the published literature in order to determine the effects that power plant emissions might have in the United States. While CO is also emitted from the plants, estimated increases in air concentrations are orders of magnitude below SLs as described in Section 4.3.4 and Tables 4.3-2 through 4.3-5, and therefore are not of concern in assessing human health impacts.

Impacts due to NH_3 and potential HAP emissions were analyzed by preparing a health risk assessment (HRA). As described in Appendix H, the HRA was conducted based on current California Office of Environmental Health Hazard Assessment (OEHHA) risk assessment guidelines (OEHHA 2000), supplemented by ARB Interim Guidance for residential inhalation exposure (ARB 2003c). A Tier 1 point estimate HRA was performed for the no action and proposed action alternatives. For this assessment, significance criteria of an increase of 1 per million in cancer risk and an increase of 1.0 in the chronic and acute hazard indices were used to assess the potential impacts.

To understand the potential health impacts associated with the alternatives, the following background information is presented on EMF, O_3, NH_3, and particulate matter (PM_{10} and $PM_{2.5}$).

4.11.2.1 Electric and Magnetic Fields

Wherever electric currents flow, EMF are produced. These fields rapidly decrease in strength with distance from the source. Electric field strengths directly beneath high-voltage power lines can reach up to several thousand volts per meter; typical electric field strengths in homes associated with the 60-Hz alternating-current sources used in the United States range from about 0 to 10 volts per meter (V/m) (NIEHS 2002). The electric field strength along the edge of the ROW for a 230-kV transmission line is about 1.5 kV/m. Power lines and electrical equipment generate both electric and magnetic fields. In recent years, however, the potential for adverse health effects from magnetic fields has been the focus of research, because a few studies have shown associations between magnetic field exposure and some types of cancers (further discussed below). No such associations have been observed for electric fields. A voluntary occupational exposure guideline of 8.3 kV/m and a general public exposure guideline of 4.3 kV/m for electric fields have been developed by the International Commission on Non-Ionizing Radiation Protection (as cited in NIEHS 2002). Since the levels at the transmission line ROWs and also at the nearest residences are lower than these values, and since exposure to electric fields is not currently linked with adverse health effects, electric field effects are not further addressed in this EIS.

Magnetic fields associated with electrical appliances are highly variable, typically ranging from less than 10 mG up to about 1,000 mG, at about 0.5 ft (0.2 m) from an operating electrical appliance such as a can opener (EPA 1992). At 4 ft (1.2 m) from the source, almost all magnetic field strengths associated with electrical appliances drop to 10 mG or less.

Other sources of magnetic fields include aboveground and underground power lines. At the edge of a typical 120-ft (37 m), 230-kV aboveground transmission line ROW, the magnetic field strength is about 20 mG; at 300 ft (91 m) from the centerline the magnetic field strength is about 0.8 mG (Lee et al. 1996), which is the approximate background level. The actual field strengths depend on line design and current levels. For example, inverted delta and split phase line configurations can result in decreases in magnetic field strength at the centerline of 25 and 58%, respectively, in comparison with the typical vertical configuration (Stoffel et al. 1994).

Exposures of the general population are most accurately measured as 24-hour averages, using personal exposure meters. Most people in the United States are exposed to 24-hour average magnetic fields of less than 2 mG. In a study of 1,000 randomly selected individuals, only 14% had 24-hour average exposures of greater than 2 mG and less than 1% had 24-hour average exposures greater than 7.5 mG (Zaffanella and Kalton 1998). Some types of work lead to increases in magnetic field exposures, especially for electrical workers, persons working near machines with electric motors, and welders. Time-weighted average exposures for these workers range from about 1 to 40 mG (NIEHS 1999). In one study of exposures of electric utility workers, the average magnetic field exposure for the workers was 9.6 mG (London et al. 1994).

The initial concern in the United States over possible adverse health effects associated with EMF started in 1979 with a publication showing an association between childhood leukemia and proximity of homes to power lines (Wertheimer and Leeper 1979). Since then, hundreds of epidemiological and laboratory studies have been conducted. Closeness to power lines has not been found to be a valid risk factor for increased childhood leukemia. However, a weak association, based on epidemiological studies, has been found between measured magnetic field exposures and both childhood and adult leukemia. In 1999, the National Institute of Environmental Health Sciences (NIEHS) completed a review of the data and concluded that there was weak scientific evidence that exposure to extremely low-frequency (ELF) EMFs could pose a leukemia hazard (NIEHS 1999). In 2002, the International Agency for Research on Cancer (IARC) classified ELF magnetic fields as possibly carcinogenic to humans (Group 2B) (IARC 2002). A 2002 California Department of Health Services report also classified exposure to magnetic fields as possibly carcinogenic to humans, as well as possibly causative in adult brain cancer, amyotrophic lateral sclerosis, and miscarriage (Neutra et al. 2002).

Electrical workers, with their higher 24-hour average magnetic field exposures, might be expected to have an elevated rate of leukemia, brain cancer, or other cancers if magnetic fields do cause cancer. Many large epidemiological studies, including tens of thousands of electrical workers, have been conducted. Of five large studies discussed in a NIEHS report (2002), only one reported a small but statistically significant increase of lung cancer and all cancers combined for electrical workers. The other four studies showed no consistent association between magnetic field exposures and cancer.

The United States does not have any Federal standards limiting occupational or residential exposure to 60-Hz EMF. Two states (Florida and New York) have standards for magnetic fields associated with power lines. Florida's limit for the edge of a 230-kV power line is 150 mG; New York's limit for any power line is 200 mG. These levels were generally based on the maximum fields that existing lines produce at maximum load-carrying conditions (NIEHS 2002), rather than health risk criteria.

As stated previously, although high levels of exposure to magnetic fields may increase the risk of certain leukemias, proximity to power lines has not been found to be associated with adverse health impacts. This is likely because there are so many individual sources of magnetic fields in homes and the workplace that elevated exposures from power lines alone cannot be distinguished from these other sources. Nonetheless, in certain locations where homes or offices are close to power lines, the lines contribute to higher levels of exposures.

4.11.2.2 Ozone

Ozone is a lung irritant that causes coughing and difficulty in breathing, especially in individuals who already have respiratory problems. People who exercise vigorously, including active children and adults, are at increased risk when ambient O_3 levels are high. Ozone can also aggravate asthma and other chronic respiratory diseases like emphysema. Repeated exposures can cause permanent lung damage.

As previously discussed in Section 3.3.2, O_3 is regulated as a criteria air pollutant under the CAA. The U.S. air quality standards for O_3 are 120 ppb (1-hour average) and 80 ppb (8-hour average). The State of California also has a 1-hour O_3 standard of 90 ppb. Decreased lung function has been observed at levels lower than the ambient air quality standards, especially for children who already have respiratory problems. A recent study of asthmatic children found that for the group of children with more severe asthma (i.e., those using maintenance medication for their asthma), levels of 1-hour O_3 greater than 59 ppb were significantly associated with wheeze and chest tightness. Levels of 1-hour O_3 greater than 73 ppb were significantly associated with shortness of breath and rescue medication use (Gent et al. 2003). A summary of studies conducted by Thurston and Ito (1999) documents an approximate 18% increase in the incidence of respiratory-related hospital admissions for each 100-ppb increase in the airborne O_3 concentration.

The EPA uses an "Air Quality Index" (AQI) to advise the public about the hazards associated with O_3 on specific days in specific locations, especially for sensitive groups (i.e., active children and adults, and people with respiratory disease) (EPA 1999a). Hourly O_3 levels between 50 and 64 ppb indicate a moderate risk, during which sensitive groups should consider limiting prolonged outdoor exertion. Hourly levels between 65 and 84 ppb indicate conditions that are unhealthy for sensitive groups, during which they should limit prolonged outdoor exertion; hourly levels between 85 and 104 indicate unhealthy conditions, during which sensitive groups should avoid prolonged outdoor exertion and others should limit exertion. Finally, hourly levels greater than 105 ppb are ranked as very unhealthy, indicating that sensitive groups should completely avoid outdoor exertion and others should limit outdoor exertion. (The EPA ranks these conditions with an AQI corresponding to 0–50, 51–100, 101–150, 150–200, and 201–300; the conversions to hourly O_3 air concentrations were obtained from the North Carolina Department of Natural Resources [2004]).

4.11.2.3 Particulate Matter

PM is particles found in the air of a certain size range and include liquid droplets. PM may be visible as smoke or haze, but individual particles are generally too small to be seen with the human eye. The composition of PM depends on its source and varies widely. It includes material of inorganic (e.g., dust, and chemical nitrates and sulfates) and organic (e.g., soot) nature. For regulatory purposes, PM is divided into PM_{10}, which is composed of particles nominally 10 μm in mean aerodynamic diameter or less, and $PM_{2.5}$, which is composed of particles nominally 2.5 μm in mean aerodynamic diameter or less. The two fractions have different sources and different health and environmental impacts. The larger-diameter particles in PM_{10} do not reach the lower regions of the lung but can cause damage to the upper respiratory tract. When inhaled, $PM_{2.5}$ reaches the alveolar (lower) region of the lung. The very small particles are not well cleared from this region and may remain for long periods of time. Often the particles are impacted on the alveolar surface, causing irritation.

PM is a health concern because inhalation of PM can cause respiratory tract irritation and lung disease. It can aggravate asthma and chronic bronchitis. A summary of studies conducted by Pope and Dockery (1999) documents an approximate 3% increase in the incidence of respiratory-related death, hospitalizations, lower respiratory symptoms, and asthma for each 10 $\mu g/m^3$ increase in airborne PM_{10}.

4.11.2.4 Health Risk Assessment for HAPs and NH_3

The HRA for this analysis was conducted in three steps. First, emissions of HAPs and NH_3 under the no action and proposed action alternatives were estimated. Second, exposure calculations were performed by using the same dispersion model as that used for the air quality assessment described in Section 4.3.2. Third, results of the exposure calculations, along with the respective cancer potency factors and chronic and acute noncancer reference exposure levels (RELs) for each toxic substance, were used to perform the risk characterization to quantify individual health risks associated with predicted levels of exposure. Multipathway risk analyses were also evaluated; the following routes of exposure were used: inhalation, soil ingestion, dermal absorption, mother's milk ingestion, and plant product ingestion.

Emissions of HAPs were calculated by using the maximum fuel input heating rate for each facility and EPA AP-42 emission factors for natural gas-fired combustion turbines. Ammonia emission rates were calculated on the basis of potential ammonia slip from the SCR systems.

The exposure assessment portion of the HRA was conducted by using the EPA model AERMOD (Version 02222). Modeled stack parameters for the turbines represent 100% load conditions, consistent with the criteria pollutant modeling discussed in Section 4.3.2. The maximum ground level concentrations were then used to assess carcinogenic risks (defined as a 70-year residential exposure) and potential chronic and acute health effects on the basis of numerical values of toxicity provided in the OEHHA risk assessment guidelines.

Next, a Tier 1 HRA was performed by using the Hot Spots Analysis and Reporting Program (HARP) model. The Tier 1 HRA utilizes a combination of the average, midpoint, and high-end point estimates to provide a range of potential exposures. Further description of the analysis methodologies is contained in Appendix H.

4.11.3 No Action

Under the no action alternative, both Presidential permits and corresponding ROWs would be denied and the transmission lines would not be built. The electric and magnetic field strengths in the projects area would equal those associated only with the existing SDG&E line.

Also under this alternative, only a portion of the EAX unit at the LRPC plant would operate (the TDM plant and the EBC unit at the LRPC plant would not operate). The power plant emissions of PM_{10} and NO_x are shown in Table 4.3-1b. The resulting air concentration increases from these emissions would be below SLs established by the EPA, as indicated in Table 4.3-5, and human health impacts from these emissions of criteria pollutants would be minimal.

As discussed in Appendix H, the HRA provides a range of potential risks by using average and high-end exposure assumptions. The potential cancer risks due to operation of three turbines at the LRPC were estimated to range from 0.41 per million to 1.50 per million. The potential impacts to chronic and acute hazard indices were modeled to be 0.002 and 0.02, respectively. The chronic and acute risks from the no action alternative are well below the significance level of 1.0.

4.11.4 Proposed Action

4.11.4.1 Electric and Magnetic Fields

Currently, no measured data are available on the magnetic field strengths at locations within or along the ROWs for the proposed Intergen and Sempra double-circuit, split-phase transmission lines. Therefore, information from the literature on field strengths for similar split-phase 230-kV transmission lines has been used in this assessment to evaluate expected field strengths. Data for similar 230-kV transmission lines suggest that magnetic field strengths at the centerline ranging from 34 to 48 mG; at 60 ft (18 m) from the centerline (corresponding to the edge of the ROW), they range from 5 to 8 mG; at 100 ft (30 m) from the centerline, they range from 1.3 to 2.3 mG; and at 200 ft (61 m) from the centerline, they range from 0.19 to 0.35 mG (Stoffel et al. 1994). Because the three 230-kV lines (one existing and two proposed) would run parallel to each other, with each line's ROW adjacent to the neighboring line's ROW, the magnetic fields in their vicinity could be somewhat greater than the fields reported in the literature for individual lines. It is also possible that some cancellation of magnetic fields would occur under this alignment of the three lines. Cancellation in single transmission lines has been observed when out-of-phase conductors from each circuit were positioned close to each other (Stoffel et al. 1994). For this assessment, the maximum magnetic field strengths for split-phase transmission lines cited above were assumed, and it was assumed that the fields would be additive.

Assuming additivity of the magnetic fields, estimates of the field strengths at varying distances from the centerlines are given in Table 4.11-1, both for the proposed transmission routes and for the two alternative routes. For the proposed routes, the highest field strength would be found directly beneath the center transmission lines (Intergen lines) at a level of approximately 53 mG (48 mG from that transmission line, plus about 2.3 mG from each of the transmission lines located 120 ft [37 m] to either side of the center transmission line). At the edge of the ROW for either the existing line or the new Sempra transmission line, the approximate magnetic field strength would be 11 mG (8 mG from the nearest transmission line 60 ft [18 m] away, plus about 2.3 mG from the transmission line 120 ft [37 m] away, and less than 0.4 mG from the transmission line 300 ft [91 m] away). At 140 ft (43 m) from the edge of the ROW on either side of the transmission lines, the field strength would be less than 0.35 mG, in the range of the background magnetic field strength of less than 1 mG.

TABLE 4.11-1 Estimated Magnetic Field Strengths Associated with the Proposed and Alternative Transmission Line Routes[a]

	Magnetic Field Strength (mG)			
Transmission Line	Centerline	Western Edge of ROW	Eastern Edge of ROW	200 ft from ROW
Existing SDG&E routes	51	11	16	≤1
Proposed routes[b]				
Intergen	53	16	16	≤1
Sempra	51	16	11	≤1
Western alternative routes[b]				
Intergen	51	8	15	≤1
Sempra	51	15	8	≤1
Eastern alternative routes[b]				
Intergen	51	8	15	≤1
Sempra	51	15	8	≤1

[a] Magnetic field strengths are estimated from published data for split-phase 230-kV transmission lines (Stoffel et al. 1994). Field strengths from the transmission lines are assumed to be additive.

[b] For the proposed routes, the three transmission lines have 120-ft (37-m) ROWs, and the three ROWs are adjacent to one another, with the existing line farthest west, the Intergen line in the middle, and the Sempra line farthest east. For the western and eastern alternative routes, the two transmission lines have 120-ft (37-m) ROWs and are adjacent to each other, with the Intergen line to the west.

Field strengths would be slightly lower if either of the alternative transmission routes was selected; however, the width of the area with a field strength greater than 10 mG would be decreased from 360 ft (110 m) (the width of the ROWs of the three lines combined) to 240 ft (73 m) (the width of the lines combined) (see Table 4.11-1).

In the United States, the proposed transmission line routes would be more than 1,500 ft (470 m) from the BLM land boundary to the east at all locations (see Figure 2.2-1). The eastern alternative routes would be more than 300 ft (91 m) from the BLM land boundary. No residences can be built on BLM property. Since magnetic fields would be at background at locations more than 140 ft (43 m) from the edge of the ROWs, no exposures above background would occur at residential locations for the proposed routes or either of the two alternative routes. No adverse health impacts would be associated with residential magnetic field exposures from the transmission lines.

Transmission line workers would have higher-than-background magnetic field exposures while working within the transmission line ROWs. Work activities would generally be limited to monthly inspections of towers and poles and other intermittent repair work. Most studies of electrical workers have not shown an association between the worker's elevated exposure levels and cancer risk (Section 4.11.2). Recreational visitors passing within the transmission line ROWs would also have higher-than-background magnetic field exposures for limited amounts of time. Exposure data suggest that these temporary elevated exposures would not result in 24-hour average exposures much greater than background levels and would not result in adverse health impacts.

4.11.4.2 Criteria Air Pollutants

Under the proposed action, the Presidential permits and corresponding ROWs would be granted. Power plant emissions would result in increases in ambient concentrations of NO_x, PM_{10}, and CO in Imperial County at estimated levels given in Section 4.3. As discussed in that section, all such increases would be below SLs established by the EPA and used as a benchmark of air quality impacts. SLs are based on corresponding NAAQS, which have a basis in human health (e.g., the SLs for NO_2, PM_{10}, and CO are 1%, 3%, and 5%, respectively, of the NAAQS). Accordingly, health impacts from plant emissions would not exceed a threshold level of concern for these pollutants.

Section 4.3.4.4.2 discusses the possible secondary formation of O_3 in the atmosphere from the primary emission of the O_3 precursors NO_x and VOC from the power plants. The conclusion of the analysis of O_3 formation in that section is that plant emissions would not contribute to a meaningful increase in O_3 concentrations in Imperial County. Health impacts from secondary O_3 formation would therefore be minimal.

Section 4.3.4.4.2 also discusses PM_{10} emissions from the power plants and the possible generation of secondary PM_{10} in the atmosphere from power plant emissions. It presents conservative estimates of corresponding PM_{10} incremental concentration increases in Imperial County resulting from power plant emissions. The proportion of areawide PM_{10} attributable to direct emissions from the power plants would be low in comparison with the total ambient concentrations, as measured at the area air quality monitoring stations (Section 3.3.2). Secondary PM from power plant emissions would only be a very small fraction of that from other emission sources in the region and would not exceed SLs in combination with direct PM emissions from the plants.

The high incidence of asthma in Imperial County is a particular concern, as noted in several studies (Collins et al. 2003; CDHS 2003). In the years 1995–1997, Imperial County had the highest age-adjusted asthma hospitalization rate for 0–14 year olds of all California counties (556 hospitalizations per 100,000 person years [CDHS 2003]). The rate for the entire Imperial County population was also high (207 hospitalizations per 100,000 person years). Ozone and PM in the region may be contributing factors. However, the operation of the TDM plant and the EBC and EAX export units at the LRPC plant would contribute only minor increases to the O_3 and PM levels in the region, and thus would result in at most a small increase in the asthma problem or other air-quality related health problems (Section 4.3.4.4.2).

On the basis of the results of many studies, it is estimated that for each 10-μg/m^3 increase in PM_{10}, there is an associated 3% increase in the incidence of respiratory-related death, hospitalizations, lower respiratory symptoms, and asthma (Pope and Dockery 1999). On the basis of this relationship, the maximum modeled increase of 2.45 μg/m^3 in ambient PM_{10} levels associated with the power plant turbines could be responsible for a 0.735% increase in the incidence of asthma.

To estimate the maximum annual increase in asthma hospitalizations in Imperial County, the overall age-adjusted hospitalization rate of 207 per 100,000 person-years, as reported by the California Department of Health Services (CDHS 2003), was multiplied by the estimated county population for 2003 of 156,600 (State of California 2003). This resulted in an estimate of 323 hospitalizations per year. To estimate the increase in asthma hospitalization incidence potentially due to power plant emissions, the number of cases (i.e., 323) would be increased by 0.735%. Thus, the estimated maximum increase in asthma hospitalizations in Imperial County would be about two to three cases. This is an overestimate, because the 2.45-μg/m^3 modeled increase is the maximum expected increase averaged over 24 hours at any location in the study area at any time. The annual average concentration increase from plant emissions in Imperial County that should be used in health impact estimates is 0.11 μg/m^3 (Table 4.3-4). Thus, the expected increase in asthma hospitalizations is less than one case per year.

4.11.4.3 Hazardous Air Pollutants and Ammonia

HAPs emitted from gas-fired power plants comprise a mixture of mainly aldehydes (mostly formaldehyde) and alkyl benzenes, for example, toluene (Appendix H). The HRA results of potential cancer risks due to HAPs emissions from operation of four turbines at the LRPC and two turbines at TDM ranged from 0.60 per million to 2.22 per million, representing the average and high-end exposure assumptions.

The current methodology for making risk management decisions in California requires that a project analyze only the incremental increase in the potential risks due to the project and does not require that existing sources be included in the risk calculations. Risks from existing sources are considered "background" sources of emissions. Therefore, the risks due to the no action alternative (estimated for the three EAX LRPC turbines) are considered background sources and were subtracted from the risks from all six turbines at both plants to obtain the incremental increase in risk from the proposed action. The incremental increase in potential risks is compared to the significance thresholds based on California risk assessment procedures.

The incremental increase in cancer risk from exposure to HAPs (NH_3 is not a carcinogen) ranges from 0.20 per million to 0.72 per million for the average and high-end exposure assumptions, respectively. The average and high-end point estimate risks are below the significance threshold of 1 per million. The incremental increase in the chronic hazard index for exposure to HAPs plus NH_3 is 0.001, and the incremental increase in the acute hazard index is 0.01, both of which are below the significance threshold of 1.0 for hazard indices.

The Tier 1 high-end point estimate approach defined by the OEHHA provides the absolute upper bound of the potential risks. The OEHHA risk assessment guidelines provide options to refine the HRA (Tiers 2 through 4). However, these further refinements were not performed, since the incremental increase in risks due to the proposed action, as estimated in the Tier 1 analysis, are below the significance thresholds.

The same risk calculation methodology used for the alternatives analysis was used to calculate the individual risks associated with operation of the LRPC and TDM power plants. The estimated cancer risk for TDM operating alone (two gas turbines) ranges from 0.06 per million to 0.22 per million. The cancer risk for LRPC operating alone (four gas turbines) ranges from 0.54 per million to 2.00 per million. The TDM risk is much lower due to the fact that there are only two turbines present at the TDM plant compared with four at the LRPC. In addition, the TDM turbines are controlled with oxidation catalysts, while the LRPC turbines do not have HAP controls.

4.11.5 Alternative Technologies

Use of alternative technologies at the power plants in Mexico would not produce changes in the EMF strengths associated with the proposed transmission lines as described under the proposed action, thus human health impacts would be the same as those described in Section 4.11.4 for the proposed action.

The use of CO oxidizers on the TDM and/or LRPC turbines could decrease CO emissions by a factor of about 7 (see Tables 4.3-4 and 4.3-6). However, the estimated CO levels at the maximum modeled receptor points would be less than 2% of the significance level even without the CO oxidizers. At such low levels, the addition of CO oxidizers would not appreciably alter the potential for human health impacts.

In terms of air emissions, the dry cooling phase of a wet-dry cooling system would not generate PM emissions from cooling tower drift (Section 4.3.5.2). Because the direct PM emissions from the power plants would not have an adverse impact using wet cooling technology as currently designed (i.e., they are below SLs), the decrease in PM emissions from the use of a dry cooling phase would result in a minor reduction of adverse impacts. However, because dry cooling reduces power plant efficiency, power plant emissions would increase accordingly.

4.11.6 Mitigation Measures

The mitigation measures described in Sections 2.4 and 4.3.6 would benefit regional air quality in Imperial County and the Mexicali area. The impacts to human health cannot be determined because design information for the individual mitigation projects has not been developed. Actions such as replacing older automobiles with a newer, less polluting fleet; paving roads; providing natural gas to fuel brick kilns in Mexicali; converting the engines of off-road diesel-powered equipment used in agriculture; increasing the use of compressed natural gas in

Imperial Valley transit buses; and installing SCR technology on the IID's Unit 3 at the steam plant — all would result in reductions of pollutant emissions in the project region.

Mitigation measures that would measurably reduce the level of PM in the study area (e.g., retiring older automobiles, paving roads) could result in a small reduction in the number of asthma cases and other respiratory problems in the region. Other sources of O_3 precursors (NO_x and VOC) in the study area would result in decreased O_3 levels and a reduced number of adverse respiratory effects.

4.12 MINORITY AND LOW-INCOME POPULATIONS

4.12.1 Major Issues

Major issues pertaining to environmental justice impacts include those elements of the projects that could potentially affect low-income and minority populations: (1) noise and dust emissions associated with transmission line construction, (2) transmission line EMF strengths and their effects in the vicinity of the proposed and alternative routes, (3) air pollution resulting from TDM and LRPC power plant emissions and its effects on the residents of Imperial County, and (4) water quantity and quality changes in the Salton Sea and their effects on residents who use the Sea for recreational and subsistence fishing.

4.12.2 Methodology

The environmental justice impacts analysis begins with the identification of minority and low-income population concentrations in census block groups in Imperial County (presented in Section 3.10). It then considers the impacts to all resource areas associated with proposed transmission line construction and operation and air emissions associated with the operation of the TDM and LRPC power plants, as presented in earlier sections of this chapter. If high and adverse impacts for the general population are identified for a particular resource area, disproportionality would be determined by comparing the proximity of the high and adverse impacts to the location of minority and low-income populations. However, if the previous analyses determine that impacts to the general population are not high and adverse as a result of the proposed action, it follows that no disproportionately high and adverse impacts to minority and low-income populations would occur. In this case, no further analysis is conducted in this section.

4.12.3 No Action

Under the no action alternative, the Presidential permits and corresponding ROWs would be denied, and the transmission lines would not be built. Demographic conditions would continue as described in Section 3.10.

4.12.4 Proposed Action

Temporary impacts from noise and dust emissions during transmission line construction and more long-term impacts from noise and EMF strengths near the transmission lines during their operation were analyzed at the block group level within a 2-mi (3-km) corridor along the proposed and alternative routes. A comparison to the spatial distribution of minority and low-income populations in Imperial County (Figures 3.10-1 and 3.10-2) shows that the temporary impacts from noise and dust emissions and the more long-term impacts from noise and EMF in the vicinity of the transmission lines would not contribute to high and adverse impacts to the general population or to disproportionately high and adverse impacts to minority and low-income populations in any block group.

Environmental justice impacts due to power plant emissions were also assessed at the block group level. Block group centroids were matched with the closest air monitoring receptor station to provide data on the local nature of emissions due to power plant operations. For each of the receptor stations, increases in air pollution due to $PM_{2.5}$ and PM_{10} emissions were found to be below SLs used as a benchmark for negligible impacts (Section 4.3). Therefore, these emissions would not contribute to high and adverse impacts to the general population or to disproportionately high and adverse impacts to minority and low-income populations in any block group.

The reduction in New River inflow to the Salton Sea would increase its salinity and nutrient concentration (Section 4.2). Current estimates indicate that even without contributions from the proposed action, salinity levels in the Salton Sea could reach critical levels detrimental to fishery resources in about 36 years. Adverse impacts to fishery resources within the Salton Sea from power plant operations would not result in high and adverse impacts to the general population who fish recreationally at the Sea. Decreases in phosphorus loading as a result of the proposed action, however, could reduce the frequency of low DO events that cause episodic fish kills (Section 4.4).

4.12.5 Alternative Technologies

Use of more efficient control technologies and/or an alternative cooling technology at the power plants in Mexico would not change transmission line construction or operations; therefore, impacts to minority and low-income populations would be the same as those described under the proposed actions. The use of emissions control technologies would have beneficial impacts to air quality (Section 4.3) and thus also would generally have beneficial impacts to minority and low-income populations. The use of a wet-dry cooling system could potentially reduce adverse impacts to the Salton Sea compared with the proposed action. However, impacts under either alternative would be minor.

4.12.6 Mitigation Measures

The mitigation measures to compensate for power plant air emissions described in Section 2.4 would likely have a beneficial impact to regional air quality. Any improvement of air quality would be viewed as a benefit to low-income and minority populations in the area of the projects. This would also be the case for measures taken to offset flow volume reductions in the New River. An assessment of impacts at the census-block level could not be conducted for this EIS because of uncertainty as to where the mitigation measures would be implemented.